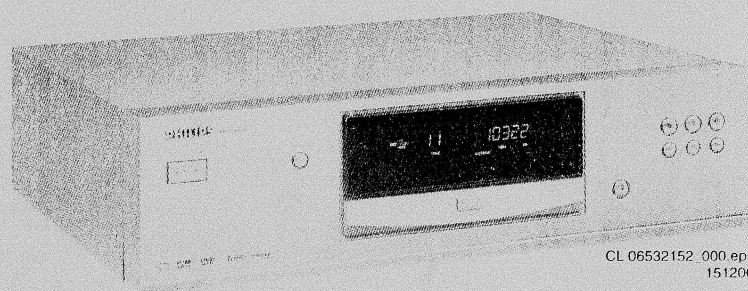
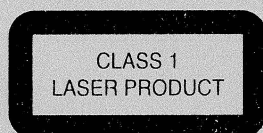


Service Service Service

CL 06532152 000.eps
151200

Service Manual



Contents	Page	
1 Technical specifications and connection facilities	2	
2 Warnings, laser safety and service hints	4	
3 Directions for use	7	
4 Mechanical- and dismantling instructions	20	
5 Diagnostic software, trouble shooting and test instructions	24	
6 <i>Wiring and block diagrams</i>		
Wiring diagram	59	
Block diagram (general)	60	
Block diagram (DAC PCB)	61	
7 <i>Electrical diagrams and print-layouts</i>		<i>Diagram PWB</i>
Display & on/off panel	62	63/64
Switched mode power supply	65	67
LPSU-L2-2N	66	67
AV Board (europe): Video control & SCART switch	(Diagram 1A) 68	71/72
AV Board (europe): Video out	(Diagram 1B) 69	71/72
AV Board (europe): Audio	(Diagram 2) 70	71/72
AV Board (US & AP): Video	(Diagram F1) 73	75/76
AV Board (US & AP): Audio	(Diagram F2) 74	75/76
DAC Board: L2N	77	80/81
DAC Board: Audio1-L2N	78	80/81
DAC Board: Audio2-L2N	79	80/81
Mono Board: DVD ALAS	(Diagram 1) 82	92-102
Mono Board: Micro controller	(Diagram 2) 82	92-102
Mono Board: CD-DVD decoder	(Diagram 3) 82	92-102
Mono Board: Program memories	(Diagram 4) 82	92-102

Contents	Page
Mono Board: CPU & MPEG decoder(Diagram 5)	82 92-102
Mono Board: Pwr supply & outp. int.(Diagram 6)	82 92-102
Mono Board: SDRAM's (Diagram 7)	82 92-102
Mono Board: SACD decoder (Diagram 8)	82 92-102
Mono Board: System clocks (Diagram 9)	82 92-102
Mono Board: DAC interface (Diagram 10)	82 92-102
8 Alignments (not available)	103
9 Circuit-, IC descriptions and List of abbreviations	103 152
10 Spareparts list	155

© Copyright 2001 Philips Consumer Electronics B.V. Eindhoven, The Netherlands.
All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, or otherwise without the prior permission of Philips.



PHILIPS

1. Technical specifications & connection facilities

1.1 General:

Mains voltage	: 120V (98 - 132V AC) for USA : 230V (198 -264V AC) for Europe/Asia : by means of voltage selector
Mains frequency	: 50 Hz - 60Hz
Power consumption mains	: < 36 W
Power consumption standby	: < 3 W (remote operatable)
Power off	: < 0.8W

1.2 Audio performance

1.2.1 Line output audio/video

Output voltage 2 channel mode	: 2Vrms ± 1.5dB
Output voltage 5.1 channel Dolby	: 1.41Vrms ± 1.5dB
Channel unbalance (1kHz)	: <0.85dB
Crosstalk 1kHz	: >105dB
Crosstalk 20Hz-20kHz	: > 95dB
Frequency response 20Hz- 20kHz	: ± 0.1dB max
Signal to noise ratio	: >100 dB
Dynamic range 1kHz	: >90dB
Dynamic range 20Hz-20kHz	: >88dB
Distortion and noise 1kHz	: >90dB
Distortion and noise 20Hz-20kHz	: >80dB
Intermodulation distortion	: >87dB
Phase non linearity	: ± 1° max.
Level non linearity	: ± 0.5dB max.
Mute (spin-up, pause, access)	: >100dB
Outband attenuation:	: > 50dB above 25kHz

1.2.2 Line output 6 channel

DSD mode stereo +5.1 multi channel (SACD)

Output voltage (1 KHz)	: 2Vrms +/- 0.3V
Channel unbalance	: <0.5dB
Cut off frequency normal mode (-3dB)	: 40KHz +/- 5KHz
Cut off frequency custom mode (-3dB)	: 50KHz +/- 5KHz
Amplitude linearity (20Hz - 20KHz)	: +0.1/-1dB max normal mode : +0.1/-0.6 dB max custom mode
Phase linearity (20Hz - 20KHz)	: tbd
SNR dig. silence; normal mode 20KHz	: -111 dB (Typical) : >108dB
SNR dig. silence; normal mode A weighted	: -114 dB (Typical) : >111dB
SNR 1KHz, -160dB normal mode 500KHz	: -50dB (Typical) : >40dB
SNR 1KHz, -160dB custom mode 500KHz	: >40dB (Typical) : >30dB
THD 0dB 1KHz	: 98dB (Typical custom mode) : 95 dB (Typical normal mode) : >96dB (custom mode) : >90 dB (normal mode)
THD 0dB 20Hz-20KHz	: >90 dB (normal mode)

Dynamic range -60dB	: 114dB (Typical) : >108 dB
Intermodulation distortion CCIF	: 108dB (Typical) : >102dB
Low level linearity (-60 to -90 dB)	: <0.5dB
Interchannel phase	: <1°
Crosstalk (20Hz-20KHz)	: 100dB (Typical) : >90dB

PCM mode up to 6 channels (DVD/ CDDA):

Output voltage (1 KHz)	: 2Vrms +/- 0.3V
Channel unbalance	: <0.5dB
Amplitude linearity (20Hz - 20KHz)	: +0.1/-0.6 dB max
Phase linearity (20Hz - 20KHz)	: tbd
SNR dig. silence; normal mode 20KHz	: >108dB
SNR dig. silence; normal mode A weighted	: >111dB
THD 0dB (1KHz)	: 95 dB typical
THD 0dB (20Hz-20KHz)	: >90dB
Dynamic range -60dB	: >108dB
Intermodulation distortion CCIF	: 105dB (Typical) : >100dB
Low level linearity (-60 to -90 dB)	: <0.5 dB
Interchannel phase	: <1°
Crosstalk (20Hz-20KHz)	: 100dB (Typical) : >90dB

1.3 Video performance

1.3.1 CVBS

CVBS output loaded with 75 Ohm
Fully according PQR3 IMS

1.3.2 S-video (Y/C)

Fully according PQR3 IMS

Connector pinning	
1 - GND	
2 - GND	
3 - Y	1Vpp ± 0.1V into 75 Ohm
4 - C	burst 300mVpp +1/-4dB into 75 Ohm

Aspect ratio switching by DC on C(pin4).

Connector type : 4 pin mini- DIN

1.4 SCART

Fully according PQR3 IMS

Connector implementation according EN50049-1; color = black; dual SCART

Fully according to prEN1057-2-1

Signal switching is P50 controlled; supported features of mode 3 see survey of applicable standards.

1.4.1 SCART II (connected to TV)

Pin signals:	
1 - Audio R	1.8V RMS
2 - Audio R	
3 - Audio L	1.8V RMS
4 - Audio GND	
5 - Blue/Chroma GND	
6 - Audio L	
7 - Blue out/ Chroma in	0.7Vpp ± 0.1V into 75 Ohm (*)

8 - Function switch	<2V = TV >4.5V / <7V = asp. ratio 16:9 DVD >9.5V / <12V = asp. ratio 4:3 DVD
---------------------	--

9 - Green GND	
10- P50 control	
11- Green	0.7Vpp ± 0.1V into 75 Ohm (*)
12- Nc	
13- Red/Chroma GND	
14- fast switch GND	
15- Red out/ Chroma out	0.7Vpp ± 0.1V into 75 Ohm (*) ± 3dB 0.3Vpp Chroma (burst)
16- fast switch RGB/ CVBS	or Y <0.4V into 75 Ohm = CVBS >1V / <3V into 75 Ohm = RGB
17- Y/CVBS GND	
18- fast switching GND	
19- CVBS/Y/RGB sync	1Vpp ± 0.1V into 75 Ohm (*)
20- CVBS/Y	
21- Shield	

1.4.2 SCART I (connected to AUX)

Pin signals:	
1 - Audio R	1.8V RMS
2 - Audio R	
3 - Audio L	1.8V RMS
4 - Audio GND	
5 - Blue/Chroma GND	
6 - Audio L	
7 - Blue in/ Chroma out	± 3dB 0.3Vpp Chroma (burst)
8 - Function switch	
9 - Green GND	
10- P50 control	
11- Green	
12- Nc	
13- Red/Chroma GND	
14- fast switch GND	
15- Red in/ Chroma in	
16- fast switch RGB/ CVBS or Y	
17- CVBS GND	
18- fast switching GND	
19- CVBS/Y/RGB sync	1Vpp ± 0.1V into 75 Ohm (*)
20- CVBS/Y	
21- Shield	
(*) for 100% white	

1.5 Digital output

1.5.1 Coaxial

CDDA/ LPCM (incl MPEG1)	: according IEC958
MPEG2, AC3 audio	: according IEC1937
DTS	: according IEC1937, amendment 1

Remark: DTS audio output mode is only available on 'digital out'

1.5.2 Optical

identical to coaxial

1.6 P50 SYSTEM CONTROL

Via SCART pin nr 10

1.7 Dimensions and weight

Place and height of feet	: acc. to Philips Harmonisation line
Apparatus tray closed	: WxDxH :435 x 330 x 110
Apparatus tray open	: WxDxH :435 x 470 x 110
Weight without packaging	: ca. 9.5 Kg
Weight in packaging	: ca. 13 Kg

1.8 Laser output power & wavelength

1.8.1 SACD/DVD

Output power	: 7mW
Wavelength	: 650nm

1.8.2 CD

Output power	: 10mW
Wavelength	: 785nm

2. Warnings, laser safety and service hints

2.1 Warning and laser safety

GB WARNING

All ICs and many other semi-conductors are susceptible to electrostatic discharges (ESD). Careless handling during repair can reduce life drastically.
When repairing, make sure that you are connected with the same potential as the mass of the set via a wrist wrap with resistance.
Keep components and tools also at this potential.



ESD

NL WAARSCHUWING

Alle IC's en vele andere halfgeleiders zijn gevoelig voor elektrostatische ontladingen (ESD).
Onzorgvuldig behandelen tijdens reparatie kan de levensduur drastisch doen verminderen.
Zorg ervoor dat u tijdens reparatie via een polsband met weerstand verbonden bent met hetzelfde potentiaal als de massa van het apparaat.
Houd componenten en hulpmiddelen ook op ditzelfde potentiaal.

F ATTENTION

Tous les IC et beaucoup d'autres semi-conducteurs sont sensibles aux décharges statiques (ESD).
Leur longévité pourrait être considérablement écourtée par le fait qu'aucune précaution n'est prise à leur manipulation.
Lors de réparations, s'assurer de bien être relié au même potentiel que la masse de l'appareil et enfiler le bracelet anti-décharge à résistance de sécurité.
Veiller à ce que les composants ainsi que les outils que l'on utilise soient également à ce potentiel.

GB

Safety regulations require that the set be restored to its original condition and that parts which are identical with those specified be used.

NL

Veiligheidsbepalingen vereisen, dat het apparaat in zijn oorspronkelijke toestand wordt terug gebracht en dat onderdelen, identiek aan de gespecificeerde worden toegepast.

D WARNUNG

Alle IC und viele andere Halbleiter sind empfindlich gegen elektrostatische Entladungen (ESD).
Unvorsorgfältige Behandlung bei der Reparatur kann die Lebensdauer drastisch vermindern.
Sorgen sie dafür, das Sie im Reparaturfall über ein Pulsammband mit Widerstand mit dem Massepotential des Gerätes verbunden sind.
Halten Sie Bauteile und Hilfsmittel ebenfalls auf diesem Potential.

I AVVERTIMENTO

Tutti IC e parecchi semi-conduttori sono sensibili alle scariche statiche (ESD).
La loro longevità potrebbe essere fortemente ridatta in caso di non osservazione della più grande cauzione alla loro manipolazione.
Durante le riparazioni occorre quindi essere collegato allo stesso potenziale che quello della massa dell'apparecchio tramite un braccialetto a resistenza.
Assicurarsi che i componenti e anche gli utensili con quali si lavora siano anche a questo potenziale.

D

Bei jeder Reparatur sind die geltenden Sicherheitsvorschriften zu beachten.
Der Originalzustand des Geräts darf nicht verändert werden.
Für Reparaturen sind Original-Ersatzteile zu verwenden.

I

Le norme di sicurezza esigono che l'apparecchio venga rimesso nelle condizioni originali e che siano utilizzati pezzi di ricambio identici a quelli specificati.

F

Les normes de sécurité exigent que l'appareil soit remis à l'état d'origine et que soient utilisées les pièces de rechange identiques à celles spécifiées.

LASER SAFETY

This unit employs a laser. Only a qualified service person should remove the cover or attempt to service this device, due to possible eye injury.

LASER DEVICE UNIT

Type:	SemiconductorlaserGaAIAs
Wave length:	650 nm (DVD) 780 nm (VCD/CD)
Output Power:	7 mW (DVD) 10 mW (VCD/CD)
Beam divergence:	60 degree



USE OF CONTROLS OR ADJUSTMENTS OR PERFORMANCE OF PROCEDURE OTHER THAN THOSE SPECIFIED HEREIN MAY RESULT IN HAZARDOUS RADIATION EXPOSURE.

AVOID DIRECT EXPOSURE TO BEAM

WARNING

The use of optical instruments with this product will increase eye hazard.
Repair handling should take place as much as possible with a disc loaded inside the player

WARNING LOCATION: INSIDE ON LASER COVERSIELD

CAUTION VISIBLE AND INVISIBLE LASER RADIATION WHEN OPEN AVOID EXPOSURE TO BEAM
ADVARSEL SYNLIG OG USYNLIG LASERSTRÅLING VED ÅBNING UNDGÅ UDSÆTTELSE FOR STRÅLING
ADVARSEL SYNLIG OG USYNLIG LASERSTRÅLING NÅR DEKSEL ÅPNES UNNGÅ EKSPONERING FOR STRÅLEN
VARNING SYNLIG OCH OSYNLIG LASERSTRÅLNING NÅR DENNA DEL ÅR ÖPPNAD BETRAKTA EJ STRÅLEN
VARO! AVATT AESSA OLET ALTTIINA NÄKYVÄLLE JA NÄKYMÄTTÖMÄLLE LASER SÄTEILYLLE. ÄLÄ KATSO SÄTEESEEN
VORSICHT SICHTBARE UND UNSICHTBARE LASERSTRAHLUNG WENN ABDECKUNG GEÖFFNET NICHT DEM STRAHL AUSSETSEN
DANGER VISIBLE AND INVISIBLE LASER RADIATION WHEN OPEN AVOID DIRECT EXPOSURE TO BEAM
ATTENTION RAYONNEMENT LASER VISIBLE ET INVISIBLE EN CAS D'OUVERTURE EXPOSITION DANGEREUSE AU FAISCEAU

Warning for powersupply on position 1005

The primary side of the powersupply including the heatsink carries live mains voltage when the player is connected to the mains even when the player is switched off !

This primary area is not shielded so it is possible to touch copper tracks and/or components when servicing the player. Service personnel have to take precautions to prevent touching this area or components in this area .

The primary side of the powersupply has been indicated with a lightning stroke and a stripe-marked printed on the printed wiring board

Note:

The screws on the mechanism of the ASD1 module (position 81 in on the exploded view drawing) may never be touched removed or re-adjusted.

Handle the ASD1 module with care when the unit has to be exchanged!

The mechanism of the ASD1 module is very sensitive for dropping or shocks.

2.2 Service hints

2.2.1 Switched Mode Power Supply 1004

This power supply unit is not repairable and must be exchanged completely in case of failure. A new power supply can be ordered with codenumber 3104 129 22150.

2.2.2 SACD module

This module can be repaired as follows:

1. The loader and DVD-M(echanism) is one assembly (VAL6011) item 81. This assembly is a not repairable unit and must be exchanged completely in case of failure. A new unit can be ordered with codenumber 9305 023 61101 (for Europe and Asia Pacific) and 9305 023 61102 (for USA).
2. The mono board has to be repaired down to component level. Repair handling of the monoboard requires a workshop with sophisticated desoldering tools.

2.2.3 Service positions

SACD module

See also dismantling instructions.

After demounting the DAC PCB 1005 and the dust bracket 241, it is possible to connect the PC connection and to demount the SACD module to service the MONO PCB. After remounting the DAC PCB, the SACD module can be placed on top of the DAC PCB, protected by an insulation plate.

MONO PCB

DAC PCB

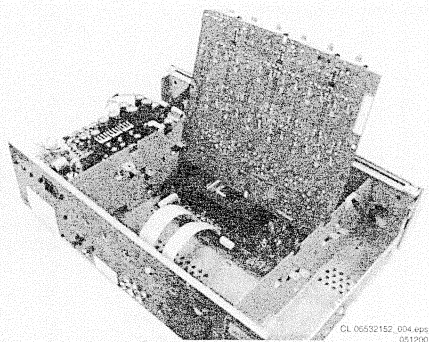


Figure 2-3

AV PCB

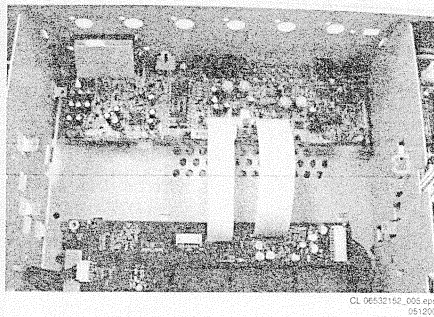


Figure 2-4

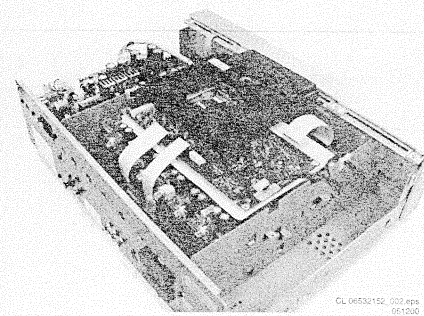


Figure 2-1

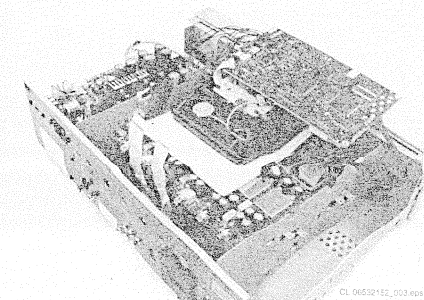


Figure 2-2

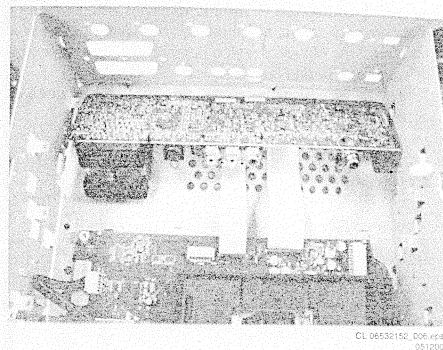
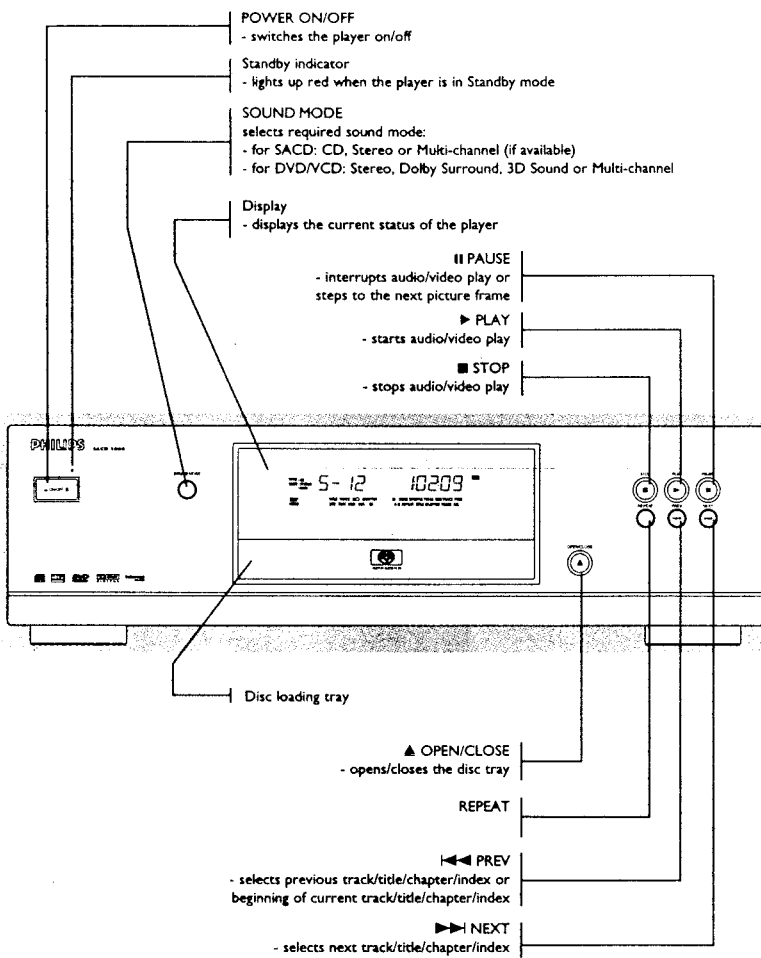


Figure 2-5

Functional overview

Front of player

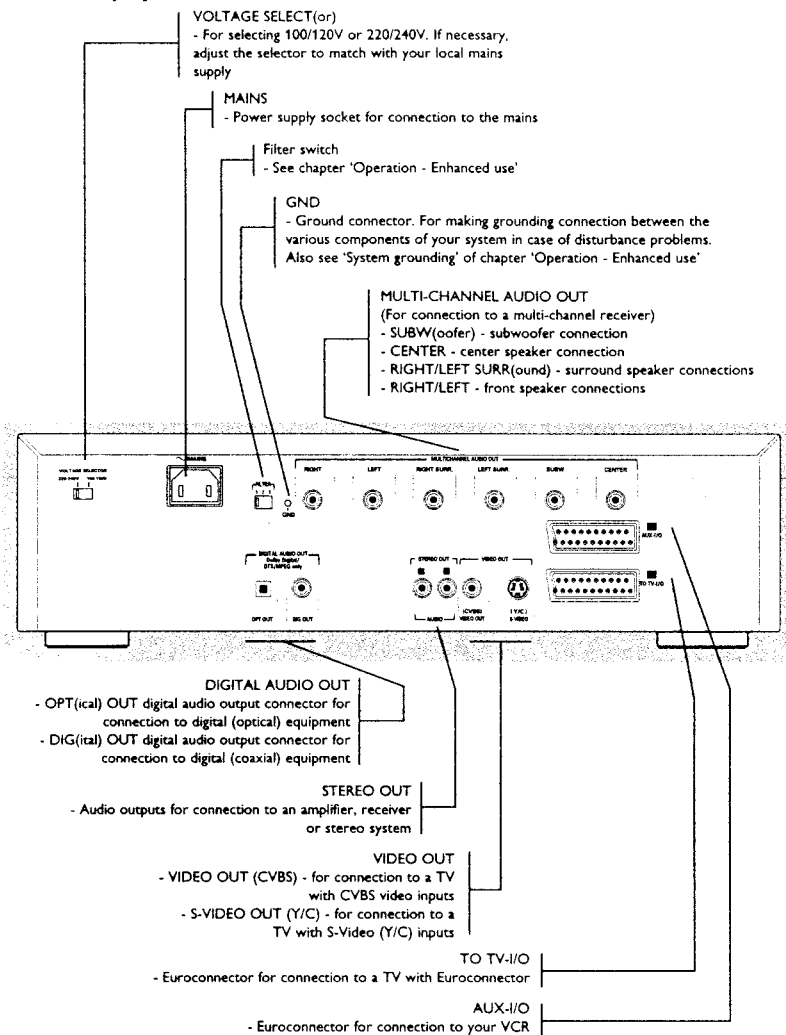


FUNCTIONAL OVERVIEW 9

Deutsch

English

Rear of player



Caution: Do not touch the inner pins of rear panel connectors. Electrostatic discharge may cause permanent damage to the unit.

10 FUNCTIONAL OVERVIEW

Display

SACD Super Audio CD inserted

CD Audio CD inserted

SVCD Super Video CD inserted

VCD Video CD inserted

STEREO indicate the current active sound mode

MCH

DVD VIDEO DVD video disc inserted

5 TITLE

- number of titles on DVD in Stop mode

- number of current title

12 CHAPTER

Number of current chapter

5 TRACK

- number of tracks on SACD/CD/VCD in Stop mode

- number of current track

12:09 TRACK TIME

track time in hours, minutes and seconds

1:12:09 TOTAL TIME

disc/program time in hours, minutes and seconds

REM TIME

remaining track time in hours, minutes and seconds when Display mode is set to Remaining time

IN playback temporarily interrupted (not active when setting Personal Preferences)

SCAN first 10 seconds of each track/chapter are played

A-B REPEAT A passage (A-B) is being repeated

SHUFFLE tracks/chapters are played in random order

REPEAT TITLE CHAPTER TRACK ALL repeat Title/Chapter/Track/All active

FTS FTS (Favourite track selection) program available for CD/DVD/VCD/SVCD inserted

RC remote control active (flashing)

DTS DTS (Digital Theatre Sound) audio on the digital output

MCH Sound mode button (for DVD) is set to Multi-channel

SUR Sound mode button (for DVD/VCD) is set to Dolby Surround

3D Sound mode button (for DVD/VCD) is set to 3D Sound

SVCD - CD
SACD - STEREO
MCH

DVD VIDEO

TITLE TRACK (RC) CHAPTER
DTS MCH SUR 3D

11 SCAN SHUFFLE TOTAL REM TRACK TIME
A-B REPEAT TITLE CHAPTER TRACK ALL

5-12 1:12:09

English

English

Remote control

TV POWER

- switches the TV to power/standby

STOP

- stops playback

SOUND MODE

- selects required sound mode
 - for SACD: CD, Stereo or Multi-channel (if available)
 - for DVD/VCD: Stereo, Dolby Surround, 3D sound or Multi-channel

PLAY

- starts audio/video play

REVERSE

- search backward

PAUSE

- pause or still frame/step frame

SLOW

- slow motion

FORWARD

- search forward

PREVIOUS

- previous track/title/chapter/index

RESUME

- resumes playback

NEXT

- next track/title/chapter/index

VOL +/-

- volume up/down in TV mode

MUTE

- mutes the sound in TV mode

CH +/-

- program up/down in TV mode

FTS

- switches FTS function ON/OFF
- displays FTS menu (FTS = Favourite Track Selection)

SHUFFLE

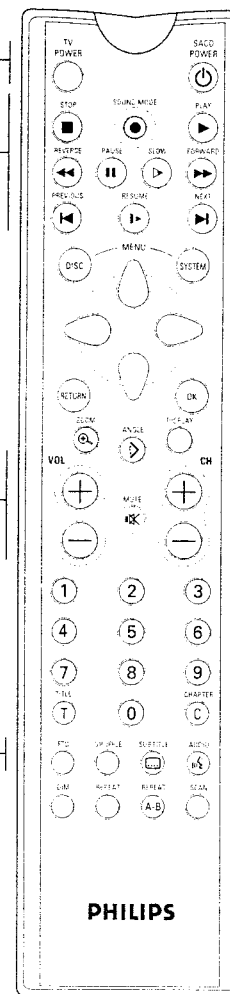
- playback in random order

SUBTITLE

- subtitle ON/OFF/selects subtitles (DVD/VCD/SVCD only)

AUDIO

- language selection



SACD POWER

- switches the player to power/standby

MENU DISC

- selects DVD-defined menu

MENU SYSTEM

- On-screen Display ON/OFF

- up/down/left/right cursor movement in OSD mode

RETURN

- return to previous menu step

ZOOM

- enlarges video image

ANGLE

- selects DVD camera angle

DISPLAY

- selects elapsed Time display or Remaining Time display

OK

- acknowledge menu selection

0-9

- numerical key pad

T

- selects titles

C

- selects chapters

PLAYER DISPLAY DIM

- adjusts display brightness

REPEAT

- repeats a track or complete disc (CD, VCD, SACD)

- repeats a chapter, title or complete disc (DVD)

REPEAT A-B

- repeats a particular passage (A-B)

SCAN

- playback of the first 10 seconds of each track, chapter, title

On screen display information

Menu bar/Status window

- | | |
|-------------------|--------------------|
| User preference | Sound |
| Track/Title | Picture by Picture |
| Chapter | Slow motion |
| Subtitle language | Fast motion |
| Angle | Time search |
| Zoom | Audio language |
| Colour | Sound Mode |
| Video FTS | |



Status window icons

The status window displays the current status of the player and is displayed together with the first part of the menu bar, if activated in the Features menu (see Personal Preferences).

General



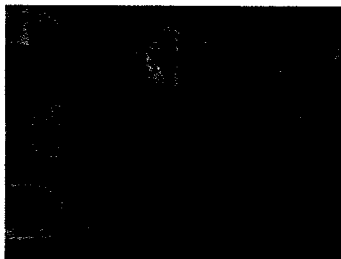
Disc type



Tray status

Default screen

The default screen is displayed when the player is in STOP mode. It may contain a status window (see 'Status Window') and a 'Temporary Feedback Field'. Giving information concerning prohibited actions, playback modes, available angles, etc.



Temporary Feedback Field icons

- | | |
|--|--|
| | Scan |
| | Repeat All |
| | Repeat Title |
| | Repeat Track |
| | Repeat Chapter |
| | Shuffle |
| | Shuffle Repeat |
| | Repeat A to end |
| | Repeat A-B |
| | Current camera angle/number of available camera angles |
| | Child Lock On |
| | Child Safe |
| | Resume |
| | Action prohibited |



Preparation

General notes

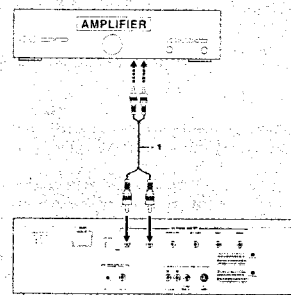
- Depending on your amplifier/receiver/Stereo System there are various ways you could connect the player. These are explained in the chapter below.
- For some connections settings for digital and/or analog output are required. These settings have to be made in the 'Personal Preferences' menu which is only accessible via your TV screen. In these cases you will need to connect the player to the TV as well.
- Please refer to your amplifier/receiver/Stereo System, TV and any other User Manual(s) as necessary to make the optimal connections.

Caution: Do not connect the player's audio output to the phono input of your audio system.

Connecting to audio equipment - analog

Connecting to an amplifier/receiver equipped with two channel analog stereo

- Connect the audio Left and Right outputs for Front speaker connection (1) to the corresponding sockets on your amplifier, receiver or stereo system. For this use the audio cable supplied.

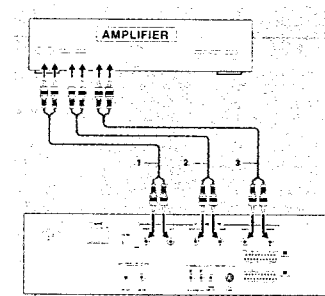


Connecting to a Multi-channel Audio/Video receiver with 6 connectors

This SACD player contains a multi-channel decoder. This enables playback of SACDs recorded in Multi-channel. You only need to select Multi-channel using the Sound Mode key.

- 1 Connect the audio Left and Right outputs for Front speaker connection (1) to the corresponding input sockets on your receiver. For this use the audio cable supplied.
- 2 Connect the audio Left and Right outputs for Surround speaker connection (2) to the corresponding inputs on your receiver. For this use an optional audio cable.
- 3 Connect the audio outputs for Center speaker and Subwoofer connection (3) to the corresponding inputs on your receiver. For this use an optional audio cable.

Note: If the subwoofer is equipped with its own amplifier, the Subwoofer connection should be connected to the subwoofer directly.



Connecting to an amplifier/receiver equipped with Dolby Pro Logic

For an amplifier/receiver with Dolby Surround, you may connect your SACD player in the same way as described for Dolby Pro Logic.

Dolby Pro Logic sound

- 1 Connect the audio Left and Right outputs for Front speaker connection (1) to the corresponding inputs on the Dolby Pro Logic Audio/Video amplifier/receiver, using the audio cable supplied.
- 2 Set Analog Output to Dolby Surround in the 'Personal Preferences' menu.

If your amplifier/receiver is equipped with a Dolby Digital decoder

- Connect the player as described in chapter 'Connecting to an Audio/Video receiver with multi-channel decoder'.

If you connect the player to a TV equipped with a Dolby Pro Logic decoder

- Connect the player to the TV as described in chapter 'Connecting to a TV'.

Connecting to audio equipment - digital

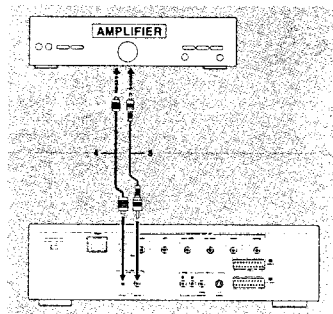
The digital output of the SACD1000 does not provide PCM (Pulse Code Modulation) signals. If your amplifier/receiver can decode only PCM and no multi-channel signals such as Dolby Digital, do not connect your SACD player via the digital input. This could damage your amplifier and/or speakers.

Connecting to an Audio/Video receiver with multi-channel decoder (Dolby Digital, MPEG 2 and DTS)

Digital Multi-channel sound (not for SACD)

For this you need a multi-channel A/V receiver that supports one or more of the DVD audio formats supported by your SACD player (MPEG 2, Dolby Digital and DTS). For this you can check the receiver manual and the logos on the front of the receiver.

- 1 Connect the player's digital audio output (optical 4 or coaxial 5) to the corresponding input on the receiver. For this use the digital audio cable (coaxial) is supplied. Optical is optional.
- 2 Set Digital Output to ALL in the 'Personal Preferences' menu.



Notes:

- If the audio format of the digital output does not match the capabilities of your receiver, the receiver will produce a strong, distorted sound. The audio format of the DVD disc in play is displayed in the Status Window, when changing the audio format.
- 6 Channel Digital Surround Sound via digital connection can only be obtained if your receiver is equipped with a Digital Multi-channel decoder. If your receiver does not contain a decoder, you can make the analog connections as described in chapter 'Connecting to a Multi-channel Audio/Video receiver with 6 connectors' to obtain 6 Channel Digital Surround Sound.
- SACD Multi-channel sound cannot be obtained via digital connection.

English

English

Connecting to a TV

Notes

- Depending on your TV there are various ways you could connect the player. These are shown in the illustration below.
- Please refer to your TV, VCR, and any other User Manual(s) as necessary to make the optimal connections.
- Do not connect your SACD-player via your VCR, because the video quality could be distorted by the copy protection system.

- 1 Connect the Euroconnector (TO TV-I/O 6) to the corresponding connector on the TV using the Euroconnector cable supplied.

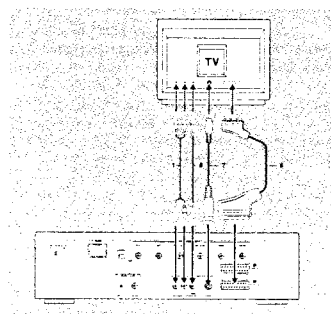
If your TV is not equipped with a Euroconnector you can select one of the following alternative connections:

S-Video (Y/C) connection

- 1 Connect the S-VIDEO OUT (Y/C) socket (7) to the corresponding socket on the TV using an optional S-Video cable.
- If you wish to receive the sound via your TV connect the STEREO OUT Left and Right output sockets (1) to the corresponding sockets on the TV using the audio cable supplied.

Video CVBS connection

- 1 Connect the VIDEO OUT (CVBS) socket (8) to the corresponding socket on the TV using the video cable supplied.
- 2 If you wish to receive the sound via your TV connect the STEREO OUT Left and Right output sockets (1) to the corresponding sockets on the TV using the audio cable supplied.



6 Channel settings - DVD only

Front speaker

- L (Large) : When the front speakers can reproduce low frequency signals below 120Hz
- S (Small) : When the front speakers cannot produce low frequency signals below 120Hz

Center Speaker*

- L (Large) : When the center speaker can reproduce low frequency signals below 120Hz
- S (Small) : When the center speaker cannot produce low frequency signals below 120Hz
- Off : When the center speaker is not connected

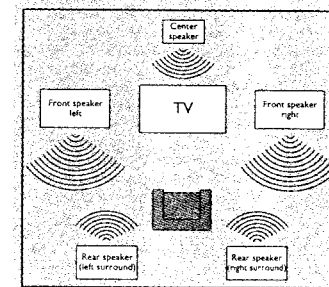
Surround speakers

- L (Large) : When the surround speakers can reproduce low frequency signals below 120Hz
- S (Small) : When the surround speakers cannot produce low frequency signals below 120Hz
- Off : When the surround speakers are not connected

Subwoofer

- On : When you connect a subwoofer
- Off : When a subwoofer is not connected

* You can use your TV as center speaker. Please refer to your TV User Manual to check if your TV can reproduce low frequency signals below 120Hz. If not, set Center Speaker to S(small). When Center Speaker is selected in the 'Personal Preferences' menu, the sound from both center speaker and audio L/R as well as the audio from the Euroconnector will contain the center speaker audio.



Delay times - DVD only

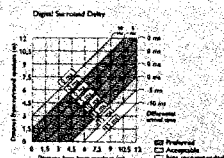
Your SACD player is set to reproduce correctly synchronized Digital Surround Sound in a listening area where the surround speakers are about 150cm nearer to the listening position than the front speakers, and the center speaker is in line with the front speakers. To adjust for other listening area arrangements, adapt delay times according to the following:

Digital Surround

Measure the distances in centimeters from the front speaker plane and from the surround speaker plane to the listening positioning plane.

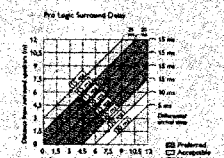
Subtract the surround distance from the front distance and divide by 30. The result is the required Surround Channel delay time in milliseconds.

If the center speaker is on the front speaker plane, no center speaker delay is needed. You can adjust the delay time in the "User Preference Settings". See Personal preference - Sound - Speaker Settings. If, however, it is nearer the listening position, measure the distance in centimeters between the front and center speaker planes, and divide by 30. The result is the required Center Channel delay time in milliseconds.



Dolby Pro Logic

If the delay times for Surround Channel and Center Channel are set for Digital Surround mode, the delay times for Dolby Pro Logic mode will automatically be calculated and set.

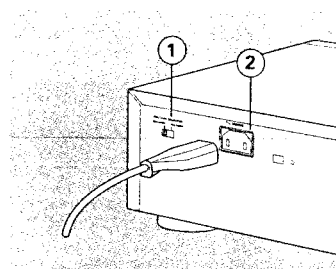


Connecting the power supply

- 1 Check if the mains voltage as shown on the type plate (on the back of the player) corresponds to your local mains voltage. If not, adjust the voltage selector (1) to match with your local mains supply.
- 2 Plug the female end of the power cable supplied into the Power connector MAINS (2) on the rear of the player.
- 3 Plug the male end of the cord into an AC outlet.

Note: When the player is in the STANDBY or OFF position, it is still consuming some power. If you wish to disconnect your player completely from the mains, withdraw the plug from the AC Outlet.

Caution: Only qualified service personnel should remove the cover or attempt to service this device.



English

English

Infra red remote control

Loading the batteries

- 1 Open the battery compartment cover.
- 2 Insert two 'AA' (LR-6) batteries as indicated inside the battery compartment.
- 3 Close the cover.

Caution: Do not mix old and new batteries. And never mix different types of batteries (standard, alkaline, etc.)

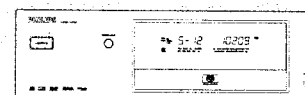


Remote control device code

To operate the player via the remote control without response of a second DVD player, you can program both player and remote control to use a second set of remote control codes.

The default system code is Code 1.

Programming the player to respond to Code 2



- 1 Press **ON/OFF** to switch off the player.
- 2 Press for 3 seconds simultaneously press **SOUND MODE** and **▲ OPEN/CLOSE** on the player and press **ON/OFF** to switch the player on again.
 ► The player will now be programmed to respond to Code 2.
 ► When step 1 and 2 are repeated the system code is set to Code 1 again.

Selecting the remote control code



- Simultaneously press **DISPLAY** and 1 or 2 on the remote control to select code 1 or 2.

► The remote control will now be set to the remote control code of your choice.
 ► This action can be repeated whenever necessary.

Operation

General explication

About this manual

This manual gives the basic instructions for operating this SACD player.

When playing DVD discs the player may not respond to all operating commands. Some DVD discs are produced in a way that requires specific operation or allows only limited operation during playback. When this occurs, please refer to the instructions in the disc inlay. When a  appears on the TV screen, the operation is not permitted by the player or the disc.

Remote control operation

- Unless otherwise stated, all operations can be carried out with the remote control. Always point the remote control directly at the player, making sure there are no obstructions in the path of the infrared beam.
- When there are corresponding keys on the front panel, they can also be used.

Menu bar operation

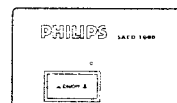
- A number of operations can also be carried out via the menu bar on the screen. The menu bar can be called up by pressing any of the following keys on the remote control: MENU SYSTEM, T, C, Angle, Audio Language, Subtitle Language, Zoom and FTS.

- The following functions can be operated via the menu bar:

- Personal Preferences;
- Track/title selection;
- Chapter selection;
- Audio language selection;
- Subtitle language selection;
- Angle selection;
- Zoom;
- Colour selection;
- Video FTS selection;
- Sound mode;
- Picture by picture;
- Slow motion;
- Fast motion;
- Time search.

- The various items can be selected with the < > (left/right cursor) keys or by pressing the relevant keys on the remote control.
- By pressing **MENU SYSTEM** the menu bar will disappear from the screen.
- When selecting an item in the menu bar, the selected item will be highlighted and the cursor keys (on the remote control), to operate this item are displayed below the icon.
- < or > indicates that more items are available at the left/right hand side of the menu bar. Press <> (left/right cursor) to select these items.

Switching on



- 1 If necessary, switch on the TV and select the video input for your SACD player.
- 2 Press **ON/OFF** on the player front panel or **STANDBY** on the remote control.
 - The player display lights up.
 - If the player is connected to the TV the start up screen appears.



English

English

Personal preferences

In this mode you can set your personal preferences for a number of player features. Some settings however must be made. This depends on the type of audio equipment connected. For this see 'Connecting to audio equipment'.

General operation



- Press **MENU SYSTEM** on the remote control.
- Select  in the menu bar and press  (down cursor).
- The Personal Preferences menu appears.
- Use the < >   (left/right/up/down) keys to toggle through the menus, sub menus and submenu options.
- When a menu item is selected, the cursor keys (on the remote control) to operate the item are displayed next to the item.
- Press **OK** to confirm and return to the main menu.

The following items can be adapted:

Picture

TV Shape

If you have a wide screen (16:9) TV, select 16:9.

If you have a regular (4:3) TV, select 4:3.

In this case you can also select between:

Letterbox for a 'wide-screen' picture with black bars top and bottom, or Pan Scan, for a full-height picture with the sides trimmed. Provided this is available on the disc in play. If a disc has Pan Scan, the picture then moves (scans) horizontally to keep the main action on the screen.

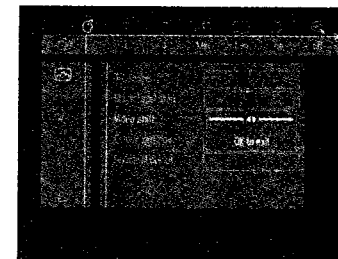


Black level shift (NTSC only)

Adapts the colour dynamics to obtain richer contrasts. Select **ON** or **OFF**.

Video shift

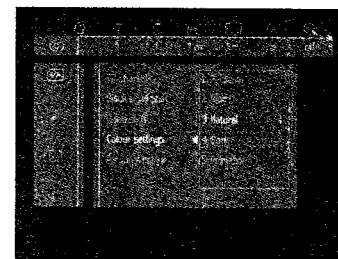
Factory setting is such that the video will be centered on your screen. Use this setting to personalize the position of the picture on your TV by scrolling it to the left or right.



Colour settings

(only when connected via Euroconnector)

You can select one of four predefined sets of colour settings and one set (Personal) which you can define yourself.



Personal colour

(only when connected via Euroconnector)

Allows you to fine-tune the selected colour settings saturation, brightness and contrast.

Sound

Analog output

Select Stereo, Dolby Surround, 3D Sound or Multi-channel. See 'Digital and Analog output Settings for DVD/VCD'. Factory setting is Multi-channel.

Dolby Surround: Select this setting when using equipment with a Dolby Surround Pro Logic decoder. In this setting the 5.1 audio channels (Dolby Digital, MPEG-2) are downmixed to a Dolby Surround compatible 2-channel output.

3D-Sound: In a setup without rear speakers (analog stereo output), 3D Sound remixes the six channels of digital surround into a two speaker output, while retaining all of the original audio information. The result is the listening sensation of being surrounded by multiple speakers.

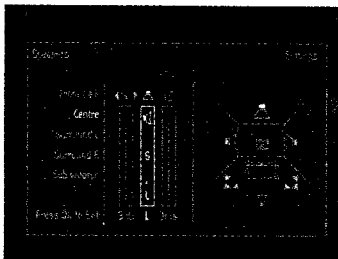
Multi-channel: Select this setting when using a multi-channel audio/(video) receiver with six inputs. In this mode, the player will perform Dolby Digital 5.1-channel decoding when applicable, and Dolby Pro Logic decoding on DVD-Video and (Super) Video-CD discs with 2-channel soundtracks. No Dolby Pro Logic decoding is done with (Super) Audio CD discs.

Night Mode

Optimizes the dynamics of the sound with low volume playback. This setting can only be used with discs that support the Night Mode feature.

Speaker settings

Allows you to select speaker settings, volume balance and delay time and to test the speaker settings. Speaker settings are only active on the Multi-channel Audio Out Outputs. Speaker settings will not be used during playback in SACD Stereo or Multi-channel Sound Mode.



Karaoke vocal

Put this setting to ON only when a multi-channel karaoke DVD is being played. The karaoke channels on the disc will then be mixed to a normal stereo sound.

Language

Select the required Menu, Audio and Subtitle language. *Menu language* - The On Screen Menus will be displayed in the language you choose. You can choose from 8 different languages.

Audio language - The sound as well as the DVD disc menu will be in the language you choose provided this is available on the disc in play. If not, speech will revert to the first spoken language on the disc. You can choose from 16 different languages.

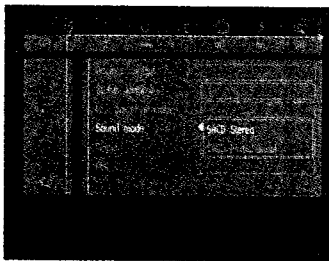
Subtitle language - The subtitles will be in the language you choose provided this is available on the disc in play. If not, subtitles will revert to the first subtitle language on the disc. You can choose from 16 different languages.

Audio language and Subtitle language can also be adapted via the Menu bar on the screen.

Features

Sound Mode (SACD only)

Selection of default SACD Sound Mode: Stereo or Multi-channel. Sound Mode setting can be changed during playback with the Sound Mode button on the player or the remote control. When selecting Multi-channel make sure your sound mode is set up for Multi-channel reproduction.



Access Control (DVD/VCD/SVCD only)

Access Control contains the following features:
Disc Lock - When Disc Lock is set to ON, a 4-digit PIN code needs to be entered in order to play discs.
Parental control - Allows the conditional presentation of DVD discs containing Parental Control information.

English

English

Status Window

Displays the current status of the player and is displayed together with the menu bar. In STOP mode it is displayed together with the 'Temporary Feedback' Field in the default screen. See 'On Screen Display information; Factory setting is ON. Select OFF to suppress display of the Status Window.



Low Power Standby

If this setting is set to ON, the player will go in low-power standby when the Standby button (remote control) is pressed. While in low-power standby, start AUX-I/O will no longer be available. All external apparatus connected to it will be ignored.

PBC

This feature allows you to disable or enable the PBC (Playback Control) menu of VCD discs. See under 'Special VCD features'; Factory settings is ON

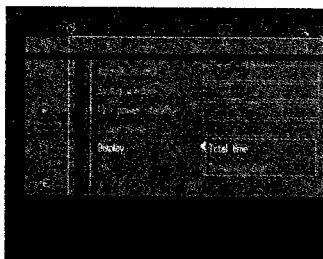
Display information

Display

Elapsed time - during playback the elapsed playing time will be displayed.

Remaining time - during playback the remaining playing time will be displayed.

Display setting can be changed during playback with the DISPLAY button on the remote control.

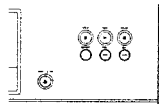


Player Display Dim (via remote control)

This feature allows you to set the display brightness. By repeatedly pressing the DIM button on the remote control you can select: normal brightness, half brightness and blank display.

Operation - Audio (Super Audio CD and CD)

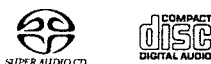
Loading a SACD or Audio disc



- 1 Press **▲ OPEN/CLOSE** on the front of the player. The disc loading tray opens.
- 2 Lay the disc in the tray, label side up. Make sure it is sitting properly in the correct recess.
- 3 Gently push the tray, or press **▲ OPEN/CLOSE**, to close the tray.

► **READING** appears on the player display and in the status window (if TV is on).
If a Super Audio CD is inserted the Sound Modes available on the disc will be shown on the player display. The current Sound Mode is indicated on both player display (with a bullet) and screen (if TV is on).

Playing a SACD or Audio disc



- Press **▶ PLAY** to start playback.
 - During playback of Super Audio CDs and audio discs all functions can be operated via the buttons on the remote control and the player front.
 - If the TV is on, the Super Audio CD or the Audio CD screen appears.
 - During play, the current track number and its elapsed playing time will be shown on the player display (and on the screen). If a default Display Time setting (Total Time/Remaining Time) is made in the Personal Preferences menu this will be shown during playback. With the **DISPLAY** button on the remote control other time indications can be selected.
 - When playing a Super Audio CD the currently selected Sound mode will be indicated on the display with a bullet.
 - At the beginning of each track the number of front channels and surround channels will be displayed (e.g. 3/2). If a subwoofer channel is present this will also be displayed (*1).



- If a default Sound mode (Stereo/Multi-channel) is selected in the Personal Preferences menu and this Sound mode is not available on the disc inserted, playback will start in the first available Sound mode on the disc.
- Playback will stop at the end of the disc.
- To stop play at any other time, press **■ STOP**.
 - The number of tracks and the total playing time will be shown on the player display (and on the screen).

Sound mode - SACD playback

- Press **SOUND MODE** on the player or the remote control to select the required Sound mode:
 - Stereo* - Super Audio Stereo reproduction.
 - Multi-channel* - Super Audio Multi-channel reproduction.
 - CD - normal CD stereo reproduction (press **■ STOP** first, then press **SOUND MODE**).

The sound modes available on the disc are indicated on the display. When selecting Multi-channel make sure your speaker configuration is set up for Multi-channel reproduction.

Pause

- Press **II PAUSE** during play.
- To return to play, press **▶ PLAY**.

Search

- To search forwards or backwards through the disc at 4x normal speed, press **◀ REVERSE** or **▶ FORWARD** during play.
 - Search begins, and sound is muted.
- To step up to 8x normal speed, press **◀ REVERSE** or **▶ FORWARD** again.
 - Search goes to 8x speed.
- To return to 4x normal speed, press **◀ REVERSE** or **▶ FORWARD** again.
- If the TV is on, search speed and direction are indicated on the screen each time **◀ REVERSE** or **▶ FORWARD** is pressed.
- To end the search, press **▶ PLAY** or **■ STOP** as desired.
 - Sound muted in 4x and 8x search.

Moving to another track

- Press **▶ NEXT** briefly during play to step forward to the next track.
- Press **◀ PREVIOUS** briefly during play to return to the beginning of the current track. Press **◀ PREVIOUS** briefly again to step back to the previous track.
- To go directly to any track, enter the track number using the numerical keys **0-9**.

English

English

Shuffle

- Press **SHUFFLE** during play.
 - The order of the tracks is changed.
- To return to normal play, press **SHUFFLE** again.

Repeat track/disc

- To repeat the currently playing track, press **REPEAT**.
 - **REPEAT TRACK** appears on the display.
- To repeat the entire disc, press **REPEAT** a second time.
 - **REPEAT ALL** appears on the display.
- To exit Repeat mode, press **REPEAT** a third time.

Repeat A-B

To repeat or loop a sequence:

- Press **REPEAT A-B** at your chosen starting point.
 - **A** appears on the player display.
- Press **REPEAT A-B** again at your chosen end point.
 - **A-B** appears on the display, and the repeat sequence begins.
- To exit the sequence, press **REPEAT A-B** again.

Scan

Plays the first 10 seconds of each track on the disc.

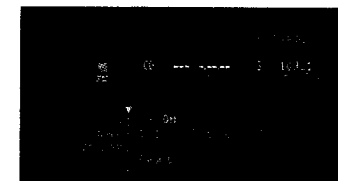
- Press **SCAN**.
- To continue play at your chosen track, press **SCAN** again or press **▶ PLAY**.

FTS (Favourite Track Selection) - Audio CD only

- The FTS feature allows you to store your favourite tracks for a particular disc in the player memory.
- Each FTS program can contain 20 tracks.
- Each time an FTS program is played it will be placed on top of the list. When the list is full and a new program is added, the last program in the list will be removed from the list.
- The selections can be called up and played at any time.
- For storing an FTS program On Screen Display operation is required.

Storing an FTS-program

- 1 Load a disc and go to Stop mode.



- 2 Use **▽** (down cursor) to go to the list of available tracks.
- 3 Use **◀** and **▶** (left/right cursor) to select tracks from the list.
 - To go directly to any track, enter the track number using the numerical keys **0-9**.
- 4 Store each track by pressing **OK**.
 - The track numbers will be added to the list of selected tracks.
 - The number of tracks and the playing time of the program will be shown on the player display and the audio screen.

When your FTS program is complete, press **▶ PLAY** to start play, the FTS program will be automatically memorized.

- Press **FTS** or use the **◀▶** (left/right cursor) to set FTS to ON or OFF.

Erasing a track from an FTS-program

- 1 Use **▽** (down cursor) to go to the list of selected tracks.
- 2 Use **◀** and **▶** (left/right cursor) to select the track number you wish to erase. To go directly to any track, enter the track number using the numerical keys **0-9**.
- 3 Press **OK**.
 - The track number will be erased from the list of selected tracks.

Erasing the complete program

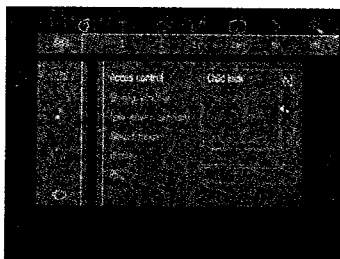
- Use **▽** (down cursor) to select **Clear All** and press **OK**.
 - The complete FTS program for the disc will be erased.

Operation - Video (DVD and VCD)

Access control; disc lock (DVD and VCD)

Activating/deactivating the disc lock

- 1 In Stop mode, select **Access Control** in the Features menu $\leftarrow$ using the ∇/Δ (down/up) keys and press $\triangleright$ (right cursor).
- 2 Enter a 4-digit PIN code of your own choice.
- 3 Enter the code a second time.
- 4 Move to **Child lock** using the ∇/Δ (down/up) keys.



- 5 Move to $\square/\square$ using the $\triangleright$ (right cursor) key.
- 6 Select $\square/\square$ using the ∇/Δ (down/up) keys.
- 7 Press **OK** to confirm or $\triangleleft$ (left cursor) to confirm and press $\triangleleft$ (left cursor) again to exit the menu.
 $\triangleright$ Now unauthorized discs will not be played unless the 4-digit code is entered.
- 8 Select $\square/\square$ to deactivate the disc lock.

Note: Reconfirmation of the 4-digit PIN code is necessary when:

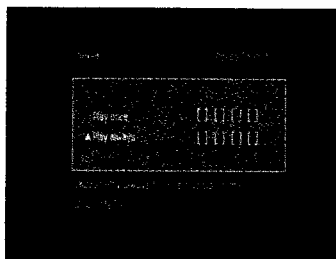
- The code is entered for the very first time (see above);
- The code is changed (see 'Changing the 4-digit code');
- The code is cancelled (see 'Changing the 4-digit code');
- Both Disc lock and Parental Control are switched OFF and the code is requested.

Authorizing discs

- Insert the disc. See 'Loading a disc'.
 $\triangleright$ The Disc lock dialog will appear. You will be asked to enter your secret code for 'Play Once' or 'Play Always'. If you select 'Play Once', the disc can be played as long as it is in the player and the player is in the ON position. If you select 'Play Always', the disc will become child safe (authorized) and can always be played even if the Disc lock is set to ON.

Notes: The player memory maintains a list of up to 80 authorized ('Child safe') disc titles. A disc will be placed in the list when 'Play Always' is selected in the 'child protect' dialog. Each time a 'child safe' disc is played it will be placed on top of the list. When the list is full and a new disc is added, the last disc in the list will be removed from the list. Double sided DVD discs may have a different ID for each side. In order to make the disc 'child safe', each side has to be authorized.

Multi volume VCD disc may have a different ID for each volume. In order to make the complete set 'child safe', each volume has to be authorized.



Deauthorizing discs

- Insert the disc. See 'Loading a disc'.
 $\triangleright$ Playback starts automatically.
- Press **STOP** while $\square$ is visible.
 $\triangleright$ The $\square$ will appear and the disc is now deauthorized.

English

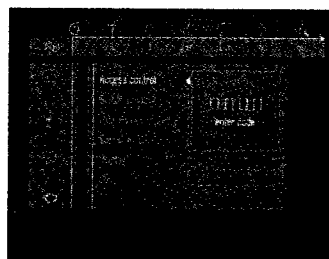
English

Access control; Parental control (DVD-Video only)

Movies on DVD discs may contain scenes not suitable for children. Therefore discs may contain 'Parental Control' information which applies to the complete disc or to certain scenes on the disc. These scenes are rated from 1 to 8 and alternative, more suitable scenes are available on the disc. Ratings are country dependent. The 'Parental Control' feature allows you to prevent discs from being played by your children or to have certain discs played with alternative scenes.

Activating/Deactivating Parental Control

- 1 In Stop mode, select **Access Control** in the Features menu $\leftarrow$ using the ∇/Δ (down/up) keys and press $\triangleright$ (right cursor).



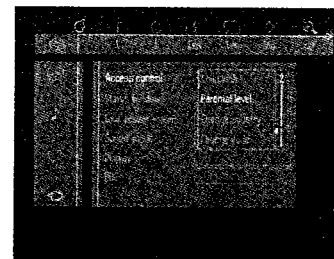
- 2 Enter your 4-digit PIN code. If necessary enter the code a second time.
- 3 Move to **Parental Level** using the ∇/Δ (down/up) keys.
- 4 Move to the Value Adjustment bar using the $\triangleright$ (right cursor) key.
- 5 Then use the ∇/Δ (down/up) keys or the numerical keys 0-9 on the remote control to select a rating from 1 to 8 for the disc inserted.

Rating 0 (displayed as $\square$):

Parental Control is not activated. The Disc will be played in full.

Ratings 1 (child safe) to 8 (adults only):

The disc contains scenes not suitable for children. If you set a rating for the player, all scenes with the same rating or lower will be played. Higher rated scenes will not be played unless an alternative is available on the disc. The alternative must have the same rating or a lower one. If no suitable alternative is found, play will stop and the 4-digit code has to be entered.



- 6 Press **OK** or $\triangleleft$ (left cursor) to confirm and press $\triangleleft$ (left cursor) again to exit the menu.

Country

- 1 In Stop mode, select **Access Control** in the Features menu $\leftarrow$ using the ∇/Δ (down/up) keys and press $\triangleright$ (right cursor).
- 2 Enter your 4-digit PIN code.
- 3 Move to **Change Country** using the ∇ (down) key.
- 4 Press the $\triangleright$ (right) key.
- 5 Select a country using ∇/Δ (down/up cursor).
- 6 Press **OK** or $\triangleleft$ (left cursor) to confirm and press $\triangleleft$ (left cursor) again to exit the menu.

Changing the 4-digit code

- 1 In Stop mode, select **Access Control** in the Features menu $\leftarrow$ using the ∇/Δ (down/up) keys and press $\triangleright$ (right cursor).
- 2 Enter the old code.
- 3 Move to **Change Code** using the ∇ (down) key.
- 4 Press the $\triangleright$ (right) key.
- 5 Enter the new 4-digit PIN code.
- 6 Enter the code a second time and reconfirm with **OK**.
- 7 Press $\triangleleft$ (left cursor) to exit the menu.

Note: If you forgot your code, press **STOP** four times while in the access control PIN code box and exit with **OK**. Access control is now switched off. You can then enter a new code (twice!) as described above.

Loading DVD or VCD discs



- 1 Press **▲ OPEN/CLOSE** on the front of the player. The disc loading tray opens.
- 2 Lay the disc in the tray, label side up (also when a double sided DVD disc is inserted). Make sure it is sitting properly in the correct recess.
- 3 Gently push the tray, or press **▲ OPEN/CLOSE**, to close the tray.
➤ **READING** appears in the status window and on the player display and playback starts automatically.

Note: If a DVD disc is inserted and 'Disc Lock' is set to ON while the disc inserted is not in the 'child safe' list (not authorized), the PIN code must be entered and/or the disc has to be authorized. (see 'Access Control')

Playing a DVD-video disc



Playing a title

- After inserting the disc and closing the tray, playback starts automatically and the status window and the player display show the type of disc loaded as well as information about the disc's contents and playing time. The disc may invite you to select an item from a menu. If the selections are numbered, press the appropriate numerical key **0-9**; if not, use the **▽/△**, **</>** (down/up/left/right) keys to highlight your selection, and press **OK**.
➤ The currently playing title and chapter number are displayed in the menu bar and the player display. The elapsed playing time is shown in the status window and the player display.
- At the beginning of each title the number of front channels and surround channels will be displayed (e.g. 3/2). If a subwoofer channel is present this will also be displayed (+1).
- If during play the audio format (MPEG 2, Dolby Digital, etc.) of a title changes this will be indicated on the display.
- If required, you can use the **SOUND MODE** key to select Stereo, Dolby Surround, 3D-Sound or Multi-channel reproduction. Play may stop at the end of the Title, this can result in return to menu.

- To stop play at any time, press **■ STOP**.
➤ The default screen will then appear, giving information about the current status of the player.
- You can resume play from the point at which you stopped by pressing **⏮ RESUME**.
➤ The resume feature applies, not only to the disc in the player, but also to the last four discs you have played. Simply reload the disc, press **▶ PLAY** and when you see the Resume icon **⏮** on the screen, press **▶ PLAY** again.

Note: Since it is usual for DVD movies to be released at different times in different regions of the world, all players have region codes and discs can have an optional region code. If you load a disc of a different region code to your player, you will see the region code notice on the screen. The disc will not play, and should be unloaded.

Playing a video CD



Playing a disc

- After inserting the disc and closing the tray, playback starts automatically and the status window and the player display show the type of disc loaded as well as information about the disc's contents and playing time.
- The disc may invite you to select an item from a menu. If the selections are numbered, press the appropriate numerical key **0-9**.
- The currently playing track number is displayed in the menu bar and the player display. The elapsed playing time is shown in the status window and the player display.
- If required, you can use the **SOUND MODE** key to select Stereo, Dolby Surround or 3D-Sound reproduction.
- To stop play at any time, press **■ STOP**.
➤ The default screen will then appear.
- You can resume play from the point at which you stopped by pressing **⏮ RESUME**. The resume feature applies, not only to the disc in the player, but also to the last four discs you have played. Simply reload the disc, press **▶ PLAY** and when you see the Resume icon **⏮** on the screen **⏮**, press **▶ PLAY** again.

General features

Note: Unless stated otherwise, all operations described are based on remote control operation. A number of operations can also be carried out via the menu bar on the screen. (see 'Menu bar operation')

Moving to another title/track

When a disc has more than one title or track (which you can see from both the menu bar and the player display), you can move to another title as follows:

- Press **T** (title), then press **▶ NEXT** briefly during play to select the next title/track.
- Press **T** (title), then press **◀ PREVIOUS** briefly during play to return to the beginning of the current title/track. Press **◀ PREVIOUS** twice briefly to step back to the previous title/track.
- To go directly to any title or track, select **T** (title), then enter the title number using the numerical keys **0-9**.

Note: If the number has more than one digit, press the keys in rapid succession.

Moving to another chapter/index

When a title on a disc has more than one chapter or a track has more than one index (which you can see from the player display and on the menu bar), you can move to another chapter/index as follows:

- Press **▶ NEXT** briefly during play to select the next chapter/index.
- Press **◀ PREVIOUS** briefly during play to return to the beginning of the current chapter/index. Press **◀ PREVIOUS** twice briefly to step back to the previous chapter/index.
- To go directly to any chapter or index, select **C** (chapter), then enter the chapter or index number using the numerical keys **0-9**.

Note: If the number has more than one digit, press the keys in rapid succession.

Slow Motion

- Select **⏮** (Slow motion) in the menu bar.
- Use the **▽** (down) key to enter the Slow Motion menu.
➤ The player will now go into Pause mode.
- Use the **</>** (left/right) keys to select the required speed: -1, -1/2, -1/4 or -1/8 (backward); +1/8, +1/4, +1/2 or +1 (forward).
- Select 1 to play at normal speed again.
- If **II PAUSE** is pressed, the speed will be set to 0.
- To exit slow motion mode, press **▶ PLAY** and then **△** (up cursor).

You can also select Slow motion speeds by using the **▶** button on the remote control.

Still Picture and Step Frame

- Select **⏮** (picture by picture) in the menu bar.
- Use the **▽** (down) key to enter the picture by picture menu.
➤ The player will now go into Pause mode.
- Use **</>** (left/right) keys to select previous or next picture.
- To exit Picture by picture mode, press **▶ PLAY**. You can also step forward by using the **II PAUSE** repeatedly on the remote control.

Search

- Select **⏮** (Fast motion) in the menu bar.
 - Use the **▽** (down) key to enter the Fast motion menu.
 - Use the **</>** (left/right) keys to select the required speed: -32, -8 or -4 (reverse); +4, +8, +32 (forward).
 - Select 1 to play at normal speed again.
 - To exit Fast motion mode, press **▶ PLAY** and then **△** (up cursor).
- To search forward or backward through different speeds, you can also use **◀** or **▶**.

Repeat

DVD-Video Discs - Repeat chapter/title/disc

- To repeat the currently playing chapter, press **REPEAT**.
➤ **REPEAT CHAPTER** appears on the player display.
- To repeat the currently playing title, press **REPEAT** a second time.
➤ **REPEAT TITLE** appears on the display.
- To repeat the entire disc, press **REPEAT** a third time.
➤ **REPEAT ALL** appears on the display.
- To exit Repeat mode, press **REPEAT** a fourth time.

Video CDs - Repeat track/disc

- To repeat the currently playing track, press **REPEAT**.
➤ **REPEAT TRACK** appears on the player display.
- To repeat the entire disc, press **REPEAT** a second time.
➤ **REPEAT ALL** appears on display and screen.
- To exit Repeat mode, press **REPEAT** a third time.

Repeat A-B

To repeat or loop a sequence in a title:

- Press **REPEAT A-B** at your chosen starting point.
 - **A** appears on the screen.
- Press **REPEAT A-B** again at your chosen end point.
 - **A-B REPEAT** appears on the display, and the repeat sequence begins.
- To exit the sequence, press **REPEAT A-B**.

Scan

Plays the first 10 seconds of each chapter on the disc.

- Press **SCAN**.
- To continue play at your chosen chapter press **SCAN** again or press **▶ PLAY**.

Shuffle

DVD-Video discs

This shuffles the playing order of chapters within a title, if the title has more than one.

- Press **SHUFFLE** during play.
 - The shuffle icon appears on the screen for about 2 seconds.
- To return to normal play, press **SHUFFLE** again.

Video CDs

This shuffles the playing order of the tracks, if the disc has more than one.

- Press **SHUFFLE** during play.
 - The Shuffle icon appears on the screen for about 2 seconds.
- To return to normal play, press **SHUFFLE** again.

Time search

The Time Search function allows you to start playing at any chosen time stamp.

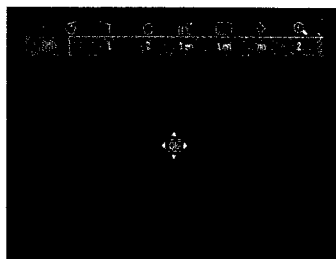
- Select **Time Search** in the menu bar.
- Press **▽** (down cursor).
 - The player will now go into Pause mode.
 - A time edit box appears on the screen showing the elapsed playing time of the current disc.
- Use the digit keys **0-9** to enter the required start time. Enter hours, minutes and seconds from left to right in the box.
 - Each time an item has been entered, the next item will be highlighted.
- Press **OK** to confirm the start time.
 - The time edit box will disappear and play starts from the selected time position.



Zoom

The Zoom function allows you to enlarge the video image and to pan through the enlarged image.

- Select **Zoom** in the menu bar.
- Press **▽** (down/up cursor) to activate the Zoom function and select the required zoom factor: 1.33 or 2 or 4.
 - The player will go into Pause mode.
 - The selected zoom factor appears below the Zoom icon **🔍** in the menu bar and 'Press OK to pan' appears below the menu bar.
 - The picture will change accordingly.
- Press **OK** to confirm the selection.
 - The panning icons appear on the screen: **△ ▽ < >** and **OK**.
- Use the **△ ▽ < >** (up/down/left/right) keys to pan all over the screen.
- When **OK** is pressed only the zoomed picture will be shown on the screen.
- If you wish to zoom at any moment, press **🔍** (Zoom) and select the required zoom factor as described above.
- To exit Zoom mode, press **▶ PLAY**.
 - Playback will resume.



English

English

FTS-Video

- The FTS-Video function allows you to store your favourite titles and chapters (DVD) and favourite tracks (VCD) for a particular disc in the player memory.
- Each FTS program can contain 20 items (titles, chapters).
- Each time an FTS program is played it will be placed on top of the list. When the list is full and a new program is added, the last program in the list will be removed from the list.
- The selections can be called up and played at any time.

Storing a FTS-Video Program

- In Stop mode, select Video FTS **🔍** in the menu bar.
- Press **▽** (down cursor) to open the menu.
 - The Video FTS menu appears.

Storing titles/tracks

- Press **▽** (down cursor) to select title.
- Use **< >** (left/right cursors) to select the required title.
- Press **OK** if you wish to store the entire title.
 - The title number will be added to the list of selections.

Storing chapters

- Press **▽** (down cursor) on the selected title number.
 - The title number will be marked and the highlight moves to the first available chapter number for this title.
- Use **< >** (left/right cursors) to select the required chapter number.
- Press **OK** to confirm the selection.
 - The title/chapter selection will be added to the list of selections.
- Press **OK** or **MENU SYSTEM** to exit the Video FTS menu.

Erasing a title/track FTS-Video Program

- In Stop mode, select Video FTS **🔍** in the menu bar.
- Use **▽** (down cursor) to select **program**.
- Use **< >** (left/right cursors) to select the required selection number.
- Press **OK** to erase the selection.
- Press **△** (up cursor) or **MENU SYSTEM** to exit the Video FTS menu.

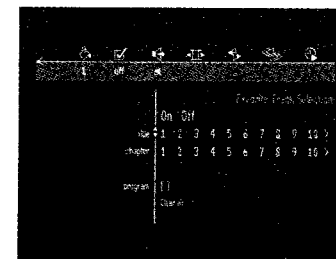
If you wish to erase all selections:

- In Stop mode, select FTS Video **🔍** in the menu bar.
- Use **▽** (down cursor) to select **Clear all**.
- Press **OK**.
 - All selections will now be erased.
- Press **△** (up cursor) or **MENU SYSTEM** to exit the Video FTS menu.

Switch FTS Video On or Off:

- Select FTS Video **🔍** in the menu bar and press **▽** (down cursor).
 - The video FTS menu appears.
- Press **< >** (left/right cursors) to select **On** or **Off**.
- Press **△** (up cursor) or **MENU SYSTEM** to exit the Video FTS menu.

You can also switch FTS Video ON or OFF by using the **FTS** button on the remote control.



Special DVD-features

Checking the contents of DVD-Video discs: Menus

For titles and chapters, selection menus may be included on the disc. The DVD's menu feature allows you to make selections from these menus. Press the appropriate numerical key; or use the ∇ , Δ , $\triangleright$, $\triangleleft$ (down/up/right/left) keys to highlight your selection, and press **OK**.

Title menus

- Press **DISC MENU**.
 - If the current title has a menu, this now appears on the screen. If no menu is present in the title, the disc menu will be displayed.
- The menu can list camera angles, spoken language and subtitle options, and chapters for the title.
- To remove the title menu, press **DISC MENU** again.

Menu Disc

- Press **T** followed by **DISC MENU**.
 - The disc menu is displayed.
- To remove the disc menu, press **DISC MENU** again.

Camera Angle



If the disc contains sequences recorded from different camera angles, the angle icon $\triangleright$ appears, showing the number of available angles, and the angle being shown.

You can then change the camera angle if you wish.

- Use the ∇ , Δ (down/up) keys to select the required angle in the angle icon.
- To go to any angle directly, enter the angle number using the numerical keys **0-9**.
 - After a small delay, play changes to the selected angle. The angle icon remains displayed until multiple angles are no longer available.

Changing the audio language



- Select Audio (Audio) in the menu bar.
- Press Audio or ∇ , Δ (down/up cursors) repeatedly to step through the different languages.
- You can enter the required language number directly using the numerical keys **0-9**.

Subtitles



- Select Subtitle (Subtitle) in the menu bar.
- Press Subtitle or ∇ , Δ (down/up cursors) repeatedly to step through the different subtitles.
- You can enter the required subtitle number directly using the numerical keys **0-9**.

Special VCD-Features

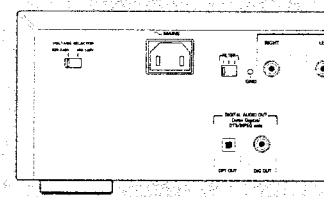
Playback Control (PBC)

- Load a Super Video CD with PBC and press **▶ PLAY**.
 - The PBC menu appears on the TV screen.
- Go through the menu with the keys indicated on the TV screen until your chosen passage starts to play. If a PBC menu consists of a list of tracks, you can select a track directly.
- Enter your choice with the numerical keys **0-9**.
- Press **RETURN** to go back to the previous menu.

Enhanced use

Filter switch

Not all amplifiers/receivers and speakers can handle the extended frequency response of SACD. Your SACD is equipped with a switchable filter on the rear. The factory setting of this filter is 40 KHz which is safe for all systems. If your system can handle the full frequency range of SACD (check the relevant manuals or, when in doubt, contact your dealer) do the following:



Set the switch to the required output signal.

Position 1 : 40 kHz - output signal on all speakers is set to 40 kHz.

Position 2 : 50 kHz FRONT/40 kHz OTHERS - output signal on front speakers is set to 50 kHz; output signal on all other speakers is set to 40 kHz.

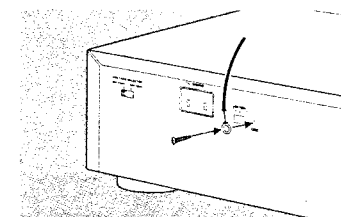
Position 3 : 50 kHz - output signal on all speakers is set to 50 kHz.

Warning: When you are not sure your system is able to handle audio input signals up to 50 KHz do not change the output signal. You may damage your speakers or amplifier/receiver.

System grounding

When your system consists of a lot of components, occasional disturbance problems (like howling noises) may occur. These problems can be solved by grounding the system.

- 1 Unscrew ground connector GND halfway, connect an earth wire to the connector and tighten the connector again.



- 2 Connect the earth wire to the ground connector of the next component in the system.
- 3 If ground connectors are available on the other components of your system, ground the other components in the same way.

Before requesting service

If it appears that the SACD player is faulty, first consult this checklist. It may be that something has been overlooked. Under no circumstances attempt to repair the system yourself; this will invalidate the warranty.

Look for the specific symptom(s). Then perform only the actions listed to remedy the specific symptom(s).

Symptom	Remedy
No power	Check if both plugs of the mains cord are properly connected. Check if there is power at the AC outlet by plugging in another appliance.
No sound	Check audio connections. If using a HiFi amplifier, try another sound source.
Distorted sound from HiFi amplifier	Check to make sure that no audio connections are made to amplifier phono input.
Disc can't be played	Ensure the disc label is upwards. Clean the disc. Check if the disc is defective by trying another disc.
No picture	Check if the TV is switched on. Check the video connection.
Distorted picture	Check the disc for fingerprints and clean with a soft cloth, wiping from centre to edge. Sometimes a small amount of picture distortion may appear. This is not a malfunction.
Completely distorted picture with player menu	The NTSC/PAL switch may be in the wrong status. Press the ■ STOP and ➡ FORWARD buttons simultaneously and keep them pressed while you turn the player ON.
No colour in picture with player menu	The NTSC/PAL switch may be in the wrong status. Press the ■ STOP and ➡ FORWARD buttons simultaneously and keep them pressed while you turn the player ON.
No return to start-up screen when disc is removed	Reset by switching the player OFF, then ON again. Check to see if the program requires another disc to be loaded.
The player does not respond to the remote control	Aim the remote control directly at the sensor on the front of the player. Avoid all obstacles that may interfere with the signal path. Inspect or replace the batteries. Check device code setting. See chapter 'Remote control device code'.
Distorted or black and white picture with DVD or Video CD disc	Use only discs that match the TV system of the TV-set used (PAL/NTSC).
No audio at digital output	Check the digital connections. Check the settings menu to make sure that the digital output is set to on. Check if the audio format of the selected audio language matches your receiver capabilities.
Buttons do not work	Reset by switching the player OFF then ON again.
Audible 'clicks' from player's internal	During operation the relais of the player may be switched, leading to an audible 'click'. This is not a malfunction.

English

English

Player does not respond to all operating Commands during playback

Operations are not permitted by the disc. Refer to the instructions in the disc inlay.

Disturbance problems (like howling noises) during playback

Ground the system. See 'System grounding'.

Cleaning discs



Some problems occur because the disc inside the player is dirty. To avoid these problems clean your discs regularly, in the following way:

- When a disc becomes dirty, clean it with a cleaning cloth. Wipe the disc from the centre out.

Caution: Do not use solvents such as benzine, thinner, commercially available cleaners, or anti-static spray intended for analog discs.

Diagnostic program

If the player is still faulty you can start the Diagnostic Program in the player.

You can operate the Diagnosis Program by following the step-by-step instructions below.

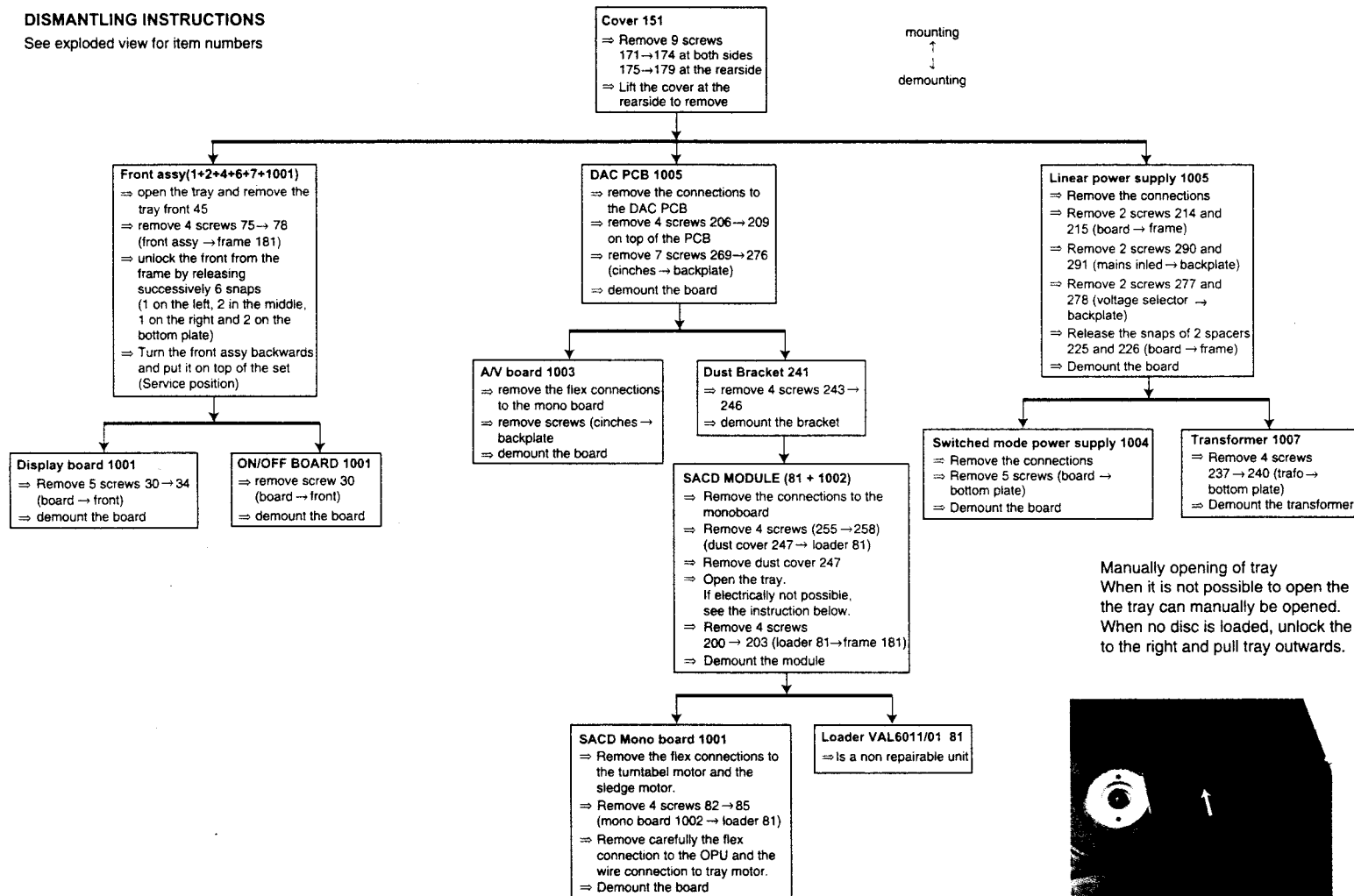
Instructions

- 1 Switch the player OFF with the **ON/OFF** button.
- 2 Press the **OPEN/CLOSE** and **II** button simultaneously and keep them pressed while you turn the player ON.
 - On the display the message **BUSY** appears together with a counter that counts down as the test is running, reaching zero by the end of the test.
 - After a few minutes, the message on the local display changes from **BUSY** to **ERROR** or to **PASS**.
 - If the message **ERROR** appears on the display, there is apparently a failure in your player and your player should be repaired.
- 3 Consult your dealer or the Philips Customer Care Centre for the nearest Service Repair Shop in your country. The phone number is given in your warranty booklet.
- 4 If the message **PASS** appears on the display, there is apparently no failure in your player. In this case the failure can be caused by incorrect interpretation of the operating instructions, the use of a wrong disc or the fact that your player is incorrectly connected. In this case, you should consult your dealer or the Philips Customer Care Centre for further assistance in solving the problem.
- 5 If the problem remains, return to point 3 of this instruction to find the nearest repair shop.
- 6 Switch the player OFF with the **ON/OFF** button to leave the diagnostic program.

4. Mechanical- and dismantling instructions

DISMANTLING INSTRUCTIONS

See exploded view for item numbers



Before requesting service

If it appears that the SACD player is faulty, first consult this checklist. It may be that something has been overlooked. Under no circumstances attempt to repair the system yourself; this will invalidate the warranty.

Look for the specific symptom(s). Then perform only the actions listed to remedy the specific symptom(s).

Symptom	Remedy
No power	Check if both plugs of the mains cord are properly connected. Check if there is power at the AC outlet by plugging in another appliance.
No sound	Check audio connections. If using a HiFi amplifier, try another sound source.
Distorted sound from HiFi amplifier	Check to make sure that no audio connections are made to amplifier phono input.
Disc can't be played	Ensure the disc label is upwards. Clean the disc. Check if the disc is defective by trying another disc.
No picture	Check if the TV is switched on. Check the video connection.
Distorted picture	Check the disc for fingerprints and clean with a soft cloth, wiping from centre to edge. Sometimes a small amount of picture distortion may appear. This is not a malfunction.
Completely distorted picture with player menu	The NTSC/PAL switch may be in the wrong status. Press the ■ STOP and ►► FORWARD buttons simultaneously and keep them pressed while you turn the player ON.
No colour in picture with player menu	The NTSC/PAL switch may be in the wrong status. Press the ■ STOP and ►► FORWARD buttons simultaneously and keep them pressed while you turn the player ON.
No return to start-up screen when disc is removed	Reset by switching the player OFF, then ON again. Check to see if the program requires another disc to be loaded.
The player does not respond to the remote control	Aim the remote control directly at the sensor on the front of the player. Avoid all obstacles that may interfere with the signal path. Inspect or replace the batteries. Check device code setting. See chapter 'Remote control device code'.
Distorted or black and white picture with DVD or Video CD disc	Use only discs that match the TV system of the TV-set used (PAL/NTSC).
No audio at digital output	Check the digital connections. Check the settings menu to make sure that the digital output is set to on. Check if the audio format of the selected audio language matches your receiver capabilities.
Buttons do not work	Reset by switching the player OFF then ON again.
Audible 'clicks' from player's internal	During operation the relays of the player may be switched, leading to an audible 'click'. This is not a malfunction.

English

English

Player does not respond to all operating Commands during playback

Operations are not permitted by the disc. Refer to the instructions in the disc inlay.

Disturbance problems (like howling noises) during playback

Ground the system. See 'System grounding'.



Cleaning discs

Some problems occur because the disc inside the player is dirty. To avoid these problems clean your discs regularly, in the following way:

- When a disc becomes dirty, clean it with a cleaning cloth. Wipe the disc from the centre out.

Caution: Do not use solvents such as benzine, thinner, commercially available cleaners, or anti-static spray intended for analog discs.

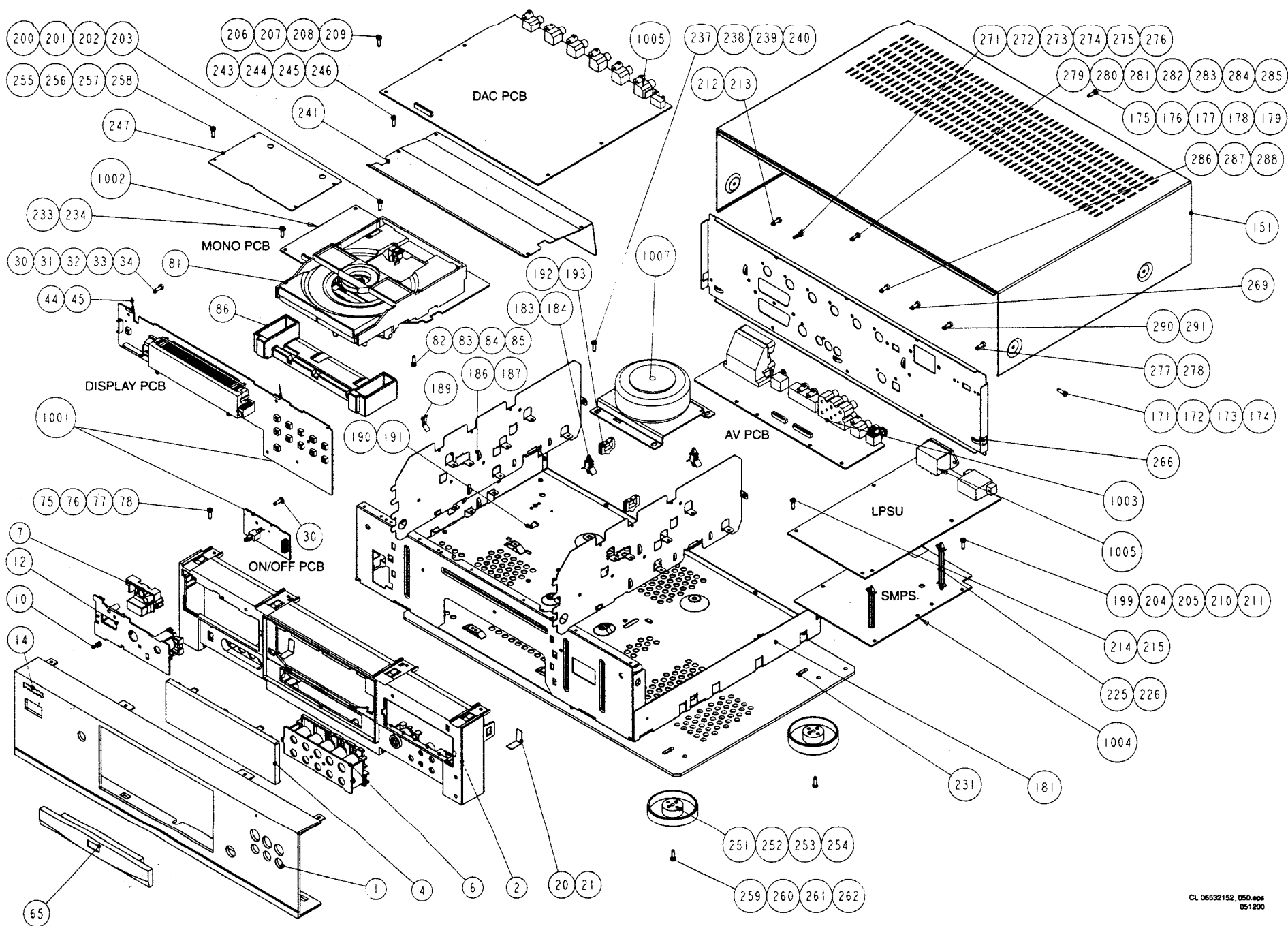
Diagnostic program

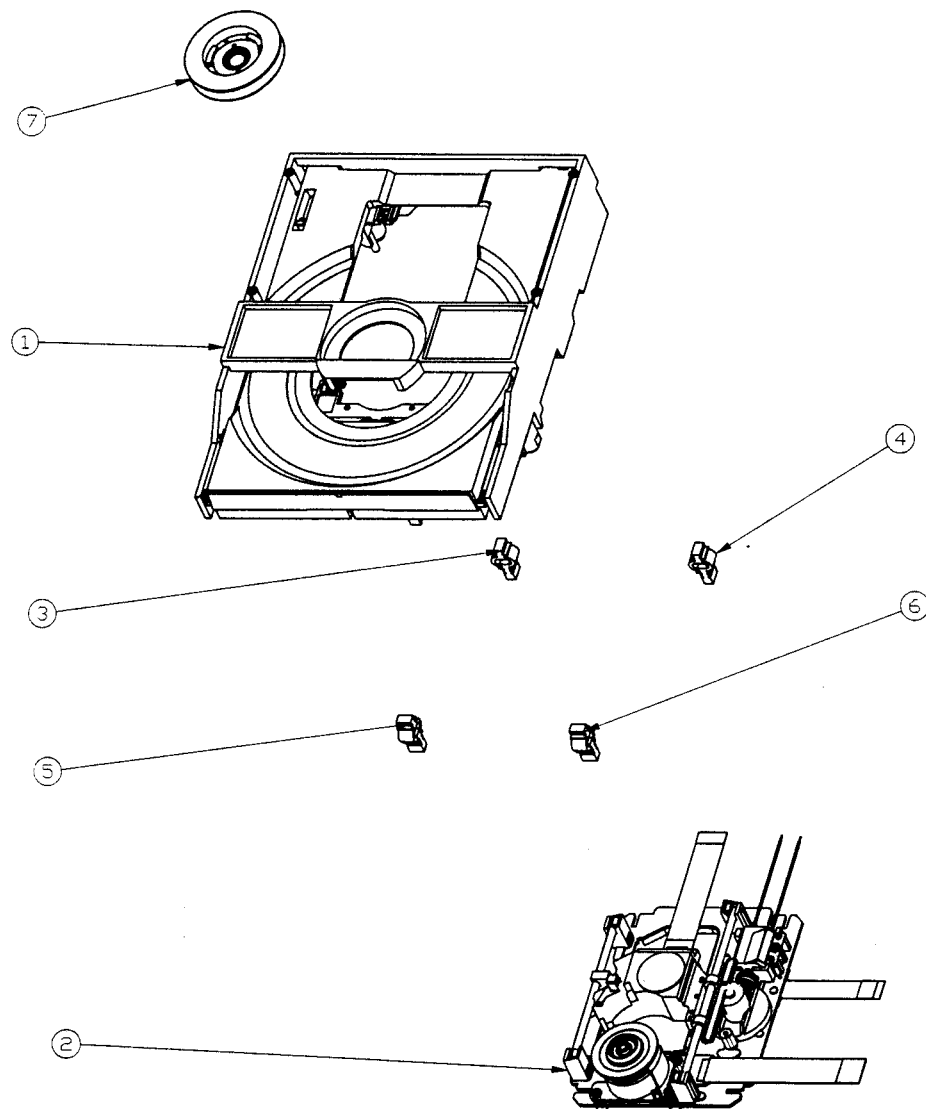
If the player is still faulty you can start the Diagnostic Program in the player.

You can operate the Diagnosis Program by following the step-by-step instructions below.

Instructions

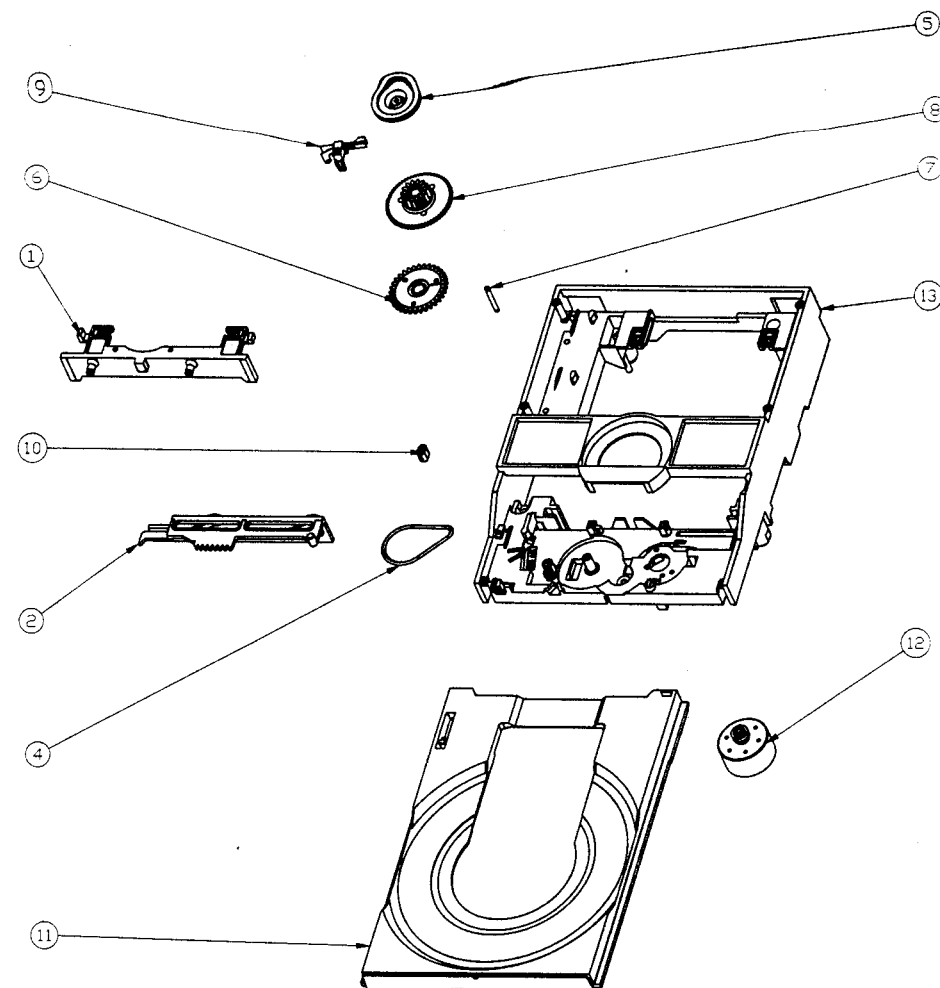
- 1 Switch the player OFF with the **ON/OFF** button.
- 2 Press the **OPEN/CLOSE** and **II** button simultaneously and keep them pressed while you turn the player ON.
 - On the display the message **BUSY** appears together with a counter that counts down as the test is running, reaching zero by the end of the test.
 - After a few minutes, the message on the local display changes from **BUSY** to **ERROR** or to **PASS**.
 - If the message **ERROR** appears on the display, there is apparently a failure in your player and your player should be repaired.
- 3 Consult your dealer or the Philips Customer Care Centre for the nearest Service Repair Shop in your country. The phone number is given in your warranty booklet.
- 4 If the message **PASS** appears on the display, there is apparently no failure in your player. In this case the failure can be caused by incorrect interpretation of the operating instructions, the use of a wrong disc or the fact that your player is incorrectly connected. In this case, you should consult your dealer or the Philips Customer Care Centre for further assistance in solving the problem.
- 5 If the problem remains, return to point 3 of this instruction to find the nearest repair shop.
- 6 Switch the player OFF with the **ON/OFF** button to leave the diagnostic program.





- | | | |
|-----|----------------|---|
| | 9305 023 61101 | VAL6011/01 LOADER COMPLETE (for /001/691) |
| | 9305 023 61102 | VAL6011/02 LOADER COMPLETE (for /171) |
| 1 | 3139 197 60090 | GENEVA LP LOADER ASSY |
| 2 | 9305 022 60101 | VAM6001/01 |
| 3+4 | 3139 194 00710 | SUSPENSION (YELLOW) |
| 5+6 | 3139 194 00620 | SUSPENSION (BLUE) |
| 7 | 3139 197 60060 | CLAMPER ASSY |

CL 06532152_051.eps
071200



- | | | |
|----|----------------|-----------------|
| 4 | 4822 358 10266 | BELT |
| 9 | 3139 198 80010 | SWITCH |
| 10 | 4822 532 13097 | TULE |
| 11 | 3139194 00270 | TRAY |
| 12 | 3139 197 50060 | TRAY MOTOR ASSY |

CL06532065-001.eps
180500

5. Diagnostic software, trouble shooting and test instructions

Due to the complexity of the SACD player, the time to find a defect in the player can become long. To reduce this time, the player has been equipped with Diagnostic and Service software (DS). The DS offers functionality to diagnose the SACD1000 player hardware and tests the following:

- Interconnections between components
- Accessibility of components
- Functionality of the audio and video paths

This functionality can be accessed via several interfaces:

1. End user/Dealer script interface
2. Player script interface
3. Menu and command interface

5.1 END USER/DEALER SCRIPT INTERFACE

5.1.1 Description

The End user/Dealer script interface gives a diagnosis on a stand alone SACD player; no other equipment is needed. During this mode, a number of hardware tests (nuclei) are automatically executed to check if the player is faulty. The diagnosis is simply a "fail" or "pass" message. If the message "FAIL" appears on the display, there is apparently a failure in the player. If the message "PASS" appears, the nuclei in this mode have been executed successfully. There can be still a failure in the player because the nuclei in this mode don't cover the complete functionality of the player.

5.1.2 Contents

The End user/Dealer script executes all diagnostic nuclei that do not need any user interaction and are meaningful on a standalone SACD player. The nuclei called in the End user/Dealer script are the following:

Display Count-down	Nucleus number	Nucleus name
7	104	Host Decoder SDRAM Write Read
6	123	Host Decoder I2C NVRAM
5	500	Front Panel Echo
4	601	Basic Engine Echo
3	1200	Furoro SDRAM Low Write Read
2	1201	Furoro SDRAM High Write Read
1	1300	DAC Board I2C Test

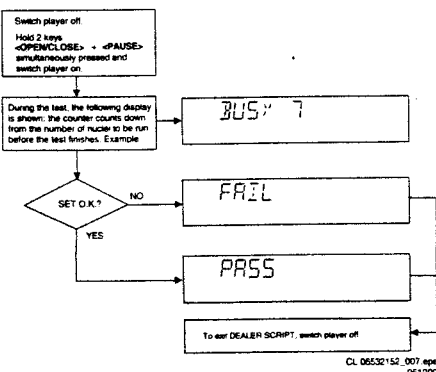


Figure 5-1

5.2 PLAYER SCRIPT INTERFACE

5.2.1 Description

The Player script will give the opportunity to perform a test that will determine which of the SACD player's modules are faulty, to read the error log and to perform an endurance loop test. To successfully perform the tests, the SACD player must be connected to a TV set, a multi-channel amplifier, a set of 6 boxes and an external video source to check the output of a number of nuclei.

To be able to check results of certain nuclei, the player script expects some interaction of the user (i.e. to approve a test picture or a test sound). Some nuclei (e.g. nuclei that test functionality of the Basic Engine module) require that the SACD player itself is opened, to enable the user to observe moving parts and approve their movement visually. Only tests within the scope of the diagnostic software will be executed hence only faults within this scope can be detected.

5.2.2 Structure of the Player Script

The player script consists of a set of nuclei testing the hardware modules in the SACD player: the Display PWB, the Digital PWB, the Basic Engine, the DAC PWB and the AV PWB.

Nuclei run by the player test need some user interaction; in the next table this interaction is described. The player test is done in two phases:

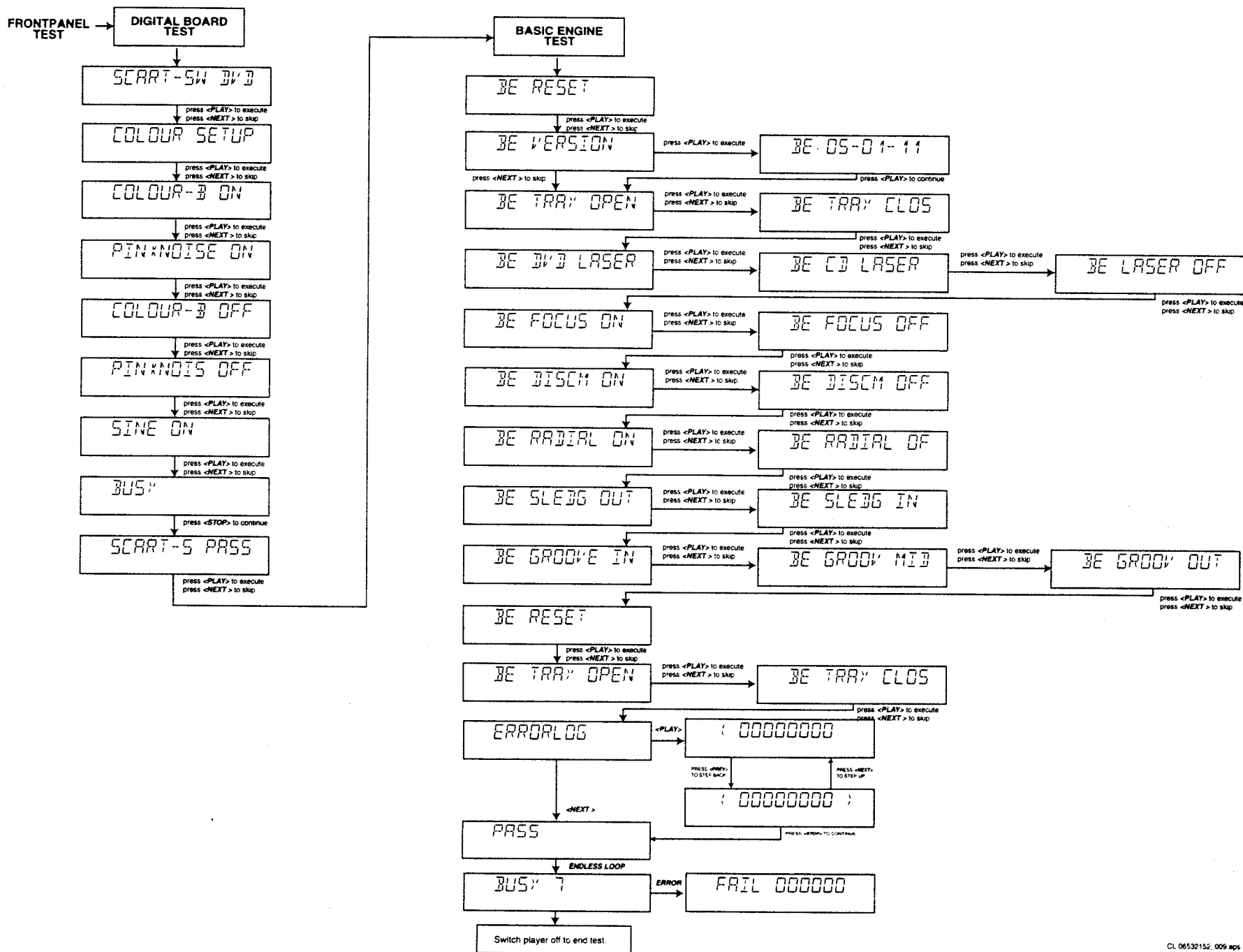
- Interactive tests: this part of the player test depends strongly on user interaction and input to determine nucleus results and to progress through the full test. Reading the error log information can be useful to determine any errors that occurred recently during normal operation of the DVD player.
- The loop test will perform the same nuclei as the dealer test, but it will loop through the list of nuclei indefinitely.

Step	Description	Executing nucleus
1	Press OPEN/CLOSE and STOP, and turn on the player.	1
2	Display shows "FP SEGMENT". Press PLAY to execute this nucleus. Otherwise press NEXT and go to step 7.	502
3	Starbursts are visible. Press PLAY.	502
4	Horizontal bars are visible. Press PLAY.	502
5	Vertical bars are visible. Press PLAY.	502
6	All segments are visible. Press PLAY.	502
7	Display shows "FP LABEL". Press PLAY to execute this nucleus. Otherwise press NEXT and go to step 13.	503
8	Labels of the first grid are visible. Press PLAY.	503
9	Labels of the second grid are visible. Press PLAY.	503
10	Labels of the third grid are visible. Press PLAY.	503
11	All labels are visible. Press PLAY.	503
12	Standby LED is on. Press PLAY.	503
13	Display shows "FP DIMMER". Press PLAY to execute this nucleus. Otherwise press NEXT and go to step 15.	518
14	Display shows "DIMMING TEST". Wait until it is dimmed, and press than PLAY.	518
15	Display shows "FP KEYBOARD". Press PLAY to execute this nucleus. Otherwise press NEXT and go to step 17.	505
16	Display shows "LKB_0000 N 0". Press all keys at least one time. Press PLAY for a least one-second to exit this nucleus.	505
17	Display shows "FP REMOTE C". Press PLAY to execute this nucleus. Otherwise press NEXT and go to step 19.	506
18	Display shows "RC C _ N_ 0". Press at least one key of the remote control. Press PLAY to exit this nucleus.	506
19	Display shows "SCART-SW DVD". Press PLAY to execute this nucleus. Otherwise press NEXT.	1408
20	Display shows "COLOUR SETUP". Press PLAY to execute this nucleus. Otherwise press NEXT.	1406
21	Display shows "COLOUR-B ON". Press PLAY to execute this nucleus. Otherwise press NEXT.	120
22	Display shows "PINKNOISE ON". Press PLAY to execute this nucleus. Otherwise press NEXT.	115
23	Display shows "COLOUR-B OFF". Press PLAY to execute this nucleus. Otherwise press NEXT.	121
24	Display shows "PINKNOIS OFF". Press PLAY to execute this nucleus. Otherwise press NEXT.	116
25	Display shows "SINE ON". Press PLAY to execute this nucleus. Otherwise press NEXT and go to step 27.	117
26	Display shows "BUSY". To stop this nucleus, press STOP.	117
27	Display shows "SCART-S PASS". Press PLAY to execute this nucleus. Otherwise press NEXT.	1409
28	Display shows "BE RESET". Press PLAY to execute this nucleus. Otherwise press NEXT.	603
29	Display shows "BE VERSION". Press PLAY to execute this nucleus. Otherwise press NEXT and go to step 31.	602
30	Display shows the version of the basic engine. To stop this nucleus, press PLAY.	602
31	Display shows "BE TRAY OPEN". Press PLAY to execute this nucleus. Otherwise press NEXT.	616
32	Display shows "BE TRAY CLOSE". Press PLAY to execute this nucleus. Otherwise press NEXT.	615
33	Display shows "BE DVD LASER". Press PLAY to execute this nucleus. Otherwise press NEXT.	635
34	Display shows "BE CD LASER". Press PLAY to execute this nucleus. Otherwise press NEXT.	636
35	Display shows "BE LASER OFF". Press PLAY to execute this nucleus. Otherwise press NEXT.	637
36	Display shows "BE FOCUS ON". Press PLAY to execute this nucleus. Otherwise press NEXT.	604
37	Display shows "BE FOCUS OFF". Press PLAY to execute this nucleus. Otherwise press NEXT.	605
38	Display shows "BE DISCM ON". Press PLAY to execute this nucleus. Otherwise press NEXT.	606
39	Display shows "BE DISCM OFF". Press PLAY to execute this nucleus. Otherwise press NEXT.	607
40	Display shows "BE RADIAL ON". Press PLAY to execute this nucleus. Otherwise press NEXT.	608
41	Display shows "BE RADIAL OF". Press PLAY to execute this nucleus. Otherwise press NEXT.	609
42	Display shows "BE SLEDG OUT". Press PLAY to execute this nucleus. Otherwise press NEXT.	611
43	Display shows "BE SLEDGE IN". Press PLAY to execute this nucleus. Otherwise press NEXT.	610
44	Display shows "BE GROOVE IN". Press PLAY to execute this nucleus. Otherwise press NEXT.	612
45	Display shows "BE GROOV MID". Press PLAY to execute this nucleus. Otherwise press NEXT.	613
46	Display shows "BE GROOV OUT". Press PLAY to execute this nucleus. Otherwise press NEXT.	614
47	Display shows "BE RESET". Press PLAY to execute this nucleus. Otherwise press NEXT.	603
48	Display shows "BE TRAY OPEN". Press PLAY to execute this nucleus. Otherwise press NEXT.	616
49	Display shows "BE TRAY CLOSE". Press PLAY to execute this nucleus. Otherwise press NEXT.	615
50	Display shows "ERRORLOG". Press PLAY to execute this nucleus. Otherwise press NEXT and go to step 52.	404
51	Display shows the error codes. With the keys NEXT and PREV it is possible to step through the error codes. To stop this nucleus, press STOP.	404
52	Display shows "PASS", this means the Player Script is finished and the execution of the User Dealer Script is started in an endless loop. The execution of the User Dealer Script will only stop, when an error occurs. The Display shows the error code.	1

Remark

In case of failure, the display shows " FAIL 00000 ". The description of the shown error code can be retrieved in the survey of Nuclei Error Codes (paragraph 5.4). Once an error occurs, it is not possible to continue the player script. Switch

off the set and restart the player script. By pressing the NEXT key, it is possible to jump over the failure and to continue the player script.



5.3.2 ERROR HANDLING

Each nucleus returns an error code. This code contains six numerals, which means:

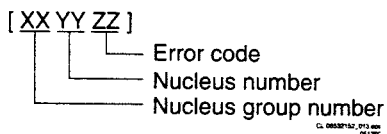


Figure 5-7

The nucleus group numbers and nucleus numbers are the same as above.

5.3.3 COMMAND MODE INTERFACE

Set-up physical interface components

Hardware required:

- Service PC
- one free COM port on the Service PC
- special cable to connect DVD player to Service PC

The service PC must have a terminal emulation program (e.g. OS2 WarpTerminal or Procomm) installed and must have a free COM port (e.g. COM1). Activate the terminal emulation program and check that the port settings for the free COM port are: 19200 bps, 8 data bits, no parity, 1 stop bit and no flow control. The free COM port must be connected via a special cable to the RS232 port of the DVD player. This special cable will also connect the test pin, which is available on the connector, to ground (i.e. activate test pin).

Code number of PC interface cable: 3122 785 90017

Activation

Switch the player on and the following text will appear on the screen of the terminal (program):

```
SACD1000 Diagnostic Software version 0.4
SDRAM Interconnection test passed
Basic SDRAM test passed

(M) enu, (C) command or (S) 2B-interface?  M : 0 C
DD>
```

Figure 5-8

The first line indicates that the Diagnostic software has been activated and contains the version number. The next lines are the successful result of the SDRAM interconnection test and the basic SDRAM test. The last line allows the user to choose between the three possible interface forms. If pressing C has made a choice for Command Interface, the prompt ("DD>") will appear. The diagnostic software is now ready to receive commands. The commands that can be given are the numbers of the nuclei.

Command overview

The tables below give an overview of the commands.

Startup

[xx yy] Number	Nuclei
startup	Test the UART of the host decoder by sending a string to the UART.

Host Decoder Tests [01]

[xx yy] Number	Nuclei
100	Checksum Flash Checks the FLASH checksum.
101	Flash Write Access 1 Checks whether the first FLASH can be written. Check if Write enable pin of flash is high. The set must be switched off to restart DSW.
102	Flash Write Access 2 Checks whether the second FLASH can be written. Check if Write enable pin of flash is high. The set must be switched off to restart DSW.
103	Flash Write Read Checks whether we can write to the FLASH. This test is non-destructive. However, this test should be used with great caution. Potential danger exists when power loss occurs when the test is being executed. The contents of the NVRAM are changed during the test and are restored after the test. However, power loss may occur before the original contents are restored. Therefore, this test is not included in scripts. Check if Write enable pin of flash is high. The set must be switched off to restart DSW.
104	SdRam Write Read The following three individual memory tests will be executed: a data bus test, an address bus test, and a device test. The first two test for electrical wiring problems and improperly inserted chips, while the third is intended to detect missing chips and catastrophic failures. As an unintended consequence, the device test will also uncover problems with the control bus wiring.
105	SdRam Write Read Fast The following two individual memory tests will be executed: a data bus test, and an address bus test. The two test for electrical wiring problems and improperly inserted chips.
106	Dram Write Read The following three individual memory tests will be executed: a data bus test, an address bus test, and a device test. The first two test for electrical wiring problems and improperly inserted chips, while the third is intended to detect missing chips and catastrophic failures. As an unintended consequence, the device test will also uncover problems with the control bus wiring. Because the DRAM is not mounted in commercial sets, this test will result in a failure.
107	Dram Write Read Fast The following two individual memory tests will be executed: a data bus test, and an address bus test. The two test for electrical wiring problems and improperly inserted chips. Because the DRAM is not mounted in commercial sets, this test will result in a failure.
108	Version Displays the version number of the St5505.
109	Mute On Switches the audio mute of the mono-board on.
110	Mute Off Switches the audio mute of the mono-board off.
111	De-Emphasis On Switches the audio de-emphasis filter in the St5505 on.
112	De-Emphasis Off Switches the audio de-emphasis filter in the St5505 off.
113	Centre-On-Stereo Pin On Sets the PIO-pin Centre_on_stereo to '1'.
114	Centre-On-Stereo Pin Off Sets the PIO-pin Centre_on_stereo to '0'.

[xx yy] Number	Nuclei
115	Pink Noise On Generates internally on the St5505 a pink noise audio signal that will be passed to all the DACs where it is converted to an analogue audio signal.
116	Pink Noise Off Switches off the pink noise audio signal generated with DS_HostPinkNoiseOn.
117	Sine On Generates a sine signal of 1 kHz on the analogue output. The sine signal digital data are stored in the audio buffer in SDRAM, passed through the audio decoder and without any further processing to the audio DAC where it is converted to an analogue audio signal. To stop the sine, press the STOP key on the local keyboard.
118	Sine Burst 1kHz Generates a sine signal of 1 kHz on the analogue output that lasts about four seconds. The generation of the signal is the same as in DS_HostSineOn.
119	Sine Burst 12kHz Generates a sine signal of 12kHz on the analogue output that lasts about four seconds. The generation of the signal is the same as in DS_HostSineOn.
120	Colour-bar On Enables colour bar in the DENC in the St5505. To make the colourbar visible on the TV screen via the SCART output, the following commands must also be given: 1406: Colour Setup Normal 1408: Scart Switch DVD
121	Colour-bar Off Disables colour bar in the DENC in the St5505.
122	NvramWrR Checks the NVRAM by writing and reading patterns to and from all locations. This test is non-destructive. However, this test should be used with great caution. Potential danger exists when power loss occurs when the test is being executed. The contents of the NVRAM are changed during the test and are restored after the test. However, power loss may occur before the original contents are restored. Therefore, this test is not used in script and menu mode.
123	NvramI2C Checks the interconnection between the I2C controller on the St5505 and the NVRAM.
124 125 126 127 128 129	Pink Noise On Channel X Generates internally on the St5505 a pink noise audio signal that will be passed to the DACs on the DAC board where it is converted to an analogue audio signal. Only one channel at the time will generate a pink noise audio signal. X indicates a channel number. It can be turned off with the nucleus 116. 124 = ch1, ..., 129 = ch6

NVRAM Tests [04]

[xx yy] Number	Nuclei
400	Resets the NVRAM. After the reset of the NVRAM, nucleus 404 will give error 40402: "NVRAM error log is invalid". Introducing an error can rectify this. (E.g. playing a disc upside down). To reset the error log, it is recommended to use nucleus 407.
404	Line1 Error Log Reads the error log from NVRAM. The information is displayed on the local display and is sent to the serial port. With the PREV and NEXT key it is possible to step through the logging information on the local display. The STOP key is used to exit this nucleus at any time.

[xx yy] Number	Nuclei
405	Line1 Lifetime Log Ends the lifetime log. The information is displayed on the local display and is sent to the serial port. The following statistics will be read from the NVRAM: Power On Time. The time in hours that the SACD player was turned on. Playing Time CDDA and VCD. The time in hours that the disc has been spinning summed up for both playing CDDA and VCD discs. Playing Time DVD. Like above but for DVD discs. Times Tray Open. The total number of times the tray has been opened. With the PREV and NEXT key it is possible to step through the logging information on the local display. The STOP key is used to exit this nucleus at any time.
406	Line1 Application Version Reads the version of the application software from a fixed location in the NVRAM.
407	Line2 Error Log Reset Resets the error log.
408	Line2 Lifetime Log Reset Resets the lifetime log.
409	Line2 Region-Code Reset Resets the region code change counter of the SACD player.

Front Panel Tests [05]

[xx yy] Number	Nuclei
500	Echo Checks the interface between the SACD Monoboard and the slave processor on the front panel by sending an 'echo' command. The I2C connection will be tested.
501	Version Returns the ROM software version and internal ID of the slave processor of the front panel.
502	Segment Checks the local display by lighting four test patterns. The following test patterns are: Show a starburst Light all horizontal segments Light all vertical segments Light all segments. User confirmation is necessary after each test pattern.
503	Label Checks the local display and LED of the front panel by lighting all labels and LED in five steps: Light the first label grid. Light the second label grid. Light the third label grid. Light all label grids. Light the LED. User confirmation is necessary after each test pattern.
504	Led Switches the LED on. User confirmation is necessary.
505	Keyboard Checks the local keyboard. The local display gives feedback on the keys that are pressed by showing their code: [LKB_xxxx N_yy]. [xxxx] Means the key-code and is hexadecimal. [yy] means the number of times this key was pressed. All keys must be tested. User confirmation is necessary at the end of the test. However, the PLAY, PREV and NEXT keys are also part of the keyboard test itself. Therefore it is needed to press these keys for one second.
506	Remote-Control Checks the interface between the remote control and the front panel. The local display gives feedback on the remote key that is pressed by showing its code: [RC C_xx N_yy]. [xx] Means the RC-key-code and is hexadecimal. [yy] means the number of times a RC-key was pressed. At least one key must be tested. User confirmation is necessary. The PLAY key confirms that at least one RC-key is tested.
518	Dimmer Dimming test of Display

User confirmation is necessary during the front panel tests. The following keys are used for user feedback:

PLAY for confirming that the test is correct. PREV when the test is not ok. NEXT is pressed in order to abort to the nucleus at any time; the nucleus is not tested successfully. The confirmation can also be sent through the serial port for automated verification. Character 'o' means 'ok'; character 'n' means that this nucleus must be aborted; the nucleus is not tested successfully. Any other key will fail the test.

Basic Engine Tests [06]

[xx yy] Number	Nuclei
600	S2B Pass Switch the RS232 port and the S2B port in pass-through mode. The only way to exit this nucleus is via a power off of the player.
601	S2B Engine Checks the S2B interface with the Basic Engine by sending an 'echo' command.
602	Version Returns the version number of the Basic Engine. The version number will also be displayed on the local display. The PLAY key is used to exit this nucleus.
603	Reset Resets the Basic Engine.
604	Focus On Puts the laser of the BE into focus (focus loop).
605	Focus Off Switches the focus loop off.
606	Disc Motor On Switches the disk motor (= spindle motor) on.
607	Disc Motor Off Switches the disk motor (= spindle motor) off.
608	Radial On Closes the radial loop.
609	Radial Off Opens the radial loop.
610	Sledge In Moves the sledge fully inwards.
611	Sledge Out Moves the sledge fully outwards.
612	Grooves In Lets the laser spot jump to the inside limit the disc.
613	Grooves Mid Lets the laser spot jump to the middle of the disc.
614	Grooves Out Let's the laser spot jump to the outside of the disc.
615	Tray In Closes the disc tray.
616	Tray Out Opens the disc tray.
635	DVD Laser On Switches the DVD laser of the BE on.
636	CD Laser On Switches the CD laser of the BE on.
637	Lasers Off Switches the lasers off.

Furore Tests [12]

[xx yy] Number	Nuclei
1200	Write Read SDRAM Low The following three individual memory tests will be executed at the lower FURORE SDRAM: a data bus test, an address bus test, and a device test. The first two test for electrical wiring problems and improperly inserted chips, while the third is intended to detect missing chips and catastrophic failures. As an unintended consequence, the device test will also uncover problems with the control bus wiring.
1201	Write Read SDRAM High The following three individual memory tests will be executed at the higher FURORE SDRAM: a data bus test, an address bus test, and a device test. The first two test for electrical wiring problems and improperly inserted chips, while the third is intended to detect missing chips and catastrophic failures. As an unintended consequence, the device test will also uncover problems with the control bus wiring.

[xx yy] Number	Nuclei
1202	Write Read Fast SDRAM Low The following two individual memory tests will be executed at the lower FURORE SDRAM: a data bus test, and an address bus test. The two test for electrical wiring problems and improperly inserted chips.
1203	Write Read Fast SDRAM High The following two individual memory tests will be executed at the higher FURORE SDRAM: a data bus test, and an address bus test. The two test for electrical wiring problems and improperly inserted chips.
1204	Id Gets the revision ID of the FURORE chip.

DAC Board Tests [13]

[xx yy] Number	Nuclei
1300	I2C Checks the interface between the I2C controller on the Hostdecoder and the DAC board.
1301	I2C Enable Enables the I2C interface.
1302	I2C Disable Disables the I2C interface.
1303	Reset Resets the DAC board.
1304	Filter SADC Selects the SADC output filters for the DACs.
1305	Filter Non-SADC Selects the non-SADC output filters for the DACs.
1306	Clock Internal Selects the internal clock of 384 * Fs. (in 44.1kHz mode)
1307	Clock External Selects the external clock. (in non 44.1 kHz mode)
1308	Mute On Switches the mute of the DAC board on.
1309	Mute Off Switches the mute of the DAC board off.
1310	Mode CDDA Switches the DACs into CDDA mode.
1311	Mode DVD48 Switches the DACs into DVD 48 kHz mode.
1312	Mode DVD96 Switches the DACs into DVD96 kHz mode.
1313	Mode DSD Switches the DACs into DSD mode.
1314	Clock Frequency SADC Selects the DAC master clock MCLK for SADC = 384Fs
1315	Clock Frequency CDDA Selects the DAC master clock MCLK for CDDA = 192Fs

Miscellaneous Tests [14]

[xx yy] Number	Nuclei
1400	Clock 11.289 MHz Switches clock A_CLK from the microclock to 11.2896 MHz.
1401	Clock 12.288 MHz Switches clock A_CLK from the microclock to 12.288 MHz.
1402	Clock 24.576 MHz Switches clock A_CLK from the microclock to 24.576 MHz.
1403	Colour Setup I2C Checks the I2C interface with the RGB video processor on the Audio/Video.
1404	Colour Setup High Sets the RGB setting to a high value, changing the intensity.
1405	Colour Setup Low Sets the RGB setting to a low value, changing the intensity.
1406	Colour Setup Normal Sets the RGB setting to a normal value, changing the intensity.
1407	Scart Switch I2C Checks the I2C interface with the scart switch on the Audio/Video board.
1408	Scart Switch Dvd Sets the switch IC on the Audio/Video board to give DVD signal.
1409	Scart Switch Pass Sets the scart IC on the Audio/Video board to pass-through the aux. scart input.

[xx yy] Number	Nuclei
1410	Scart Low Steers pin 16 on the scart connector with the value low (0 to 2 V).
1411	Scart Medium Steers pin 16 on the scart connector with the value medium (4.5 to 7 V).

5.3.4 MENU MODE INTERFACE

Activation

Switch the player on and the following text will appear on the screen of the terminal (program):

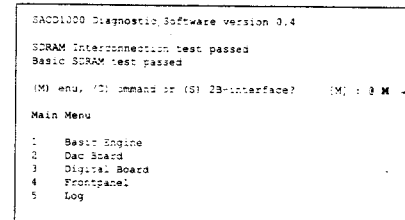


Figure 5-9

The first line indicates that the Diagnostic software has been activated and contains the version number. The next lines are the successful result of the SDRAM interconnection test and the basic SDRAM test. The last line allows the user to choose between the three possible interface forms. If pressing M has made a choice for Menu Interface, the Main Menu will appear.

Menu structure

The following menu structure is given after starting up the SACD1000 player in menu mode. The symbol → indicates that the current menu choice will invoke the display of a submenu. The number between [] mean the nucleus number. These numbers will not be shown on the screen.

Main Menu

- 1. Basic Engine →
- 2. Dac Board →
- 3. Digital Board →
- 4. Front panel →
- 5. Log →

Basic Engine Menu

- 1. Disc Motor →
- 2. Focus →
- 3. Grooves →
- 4. Laser →
- 5. Radial →
- 6. Sledge →
- 7. Tray →
- 8. Reset [603]
- 9. S2B Pass [600]
- 10. S2B Echo [601]
- 11. Version [602]

Disc Motor Menu

- 1. On [606]
- 2. Off [607]

Focus Menu

- 1. On [604]
- 2. Off [605]

Grooves Menu

- 1. Inside of the Disc [612]
- 2. Middle of the Disc [613]
- 3. Outside of the Disc [614]

Laser Menu

- 1. DVD Laser On [635]
- 2. CD Laser On [636]
- 3. Lasers Off [637]

Radial Menu

- 1. On [608]
- 2. Off [609]

Sledge Menu

- 1. Move Inwards [610]
- 2. Move Outwards [611]

Tray Menu

- 1. Open [616]
- 2. Close [615]

DAC Board Menu

- 1. Clock →
- 2. DAC Mode →
- 3. Filter SADC →
- 4. I2C →
- 5. Mute →
- 6. Reset [1303]

DAC Clock Menu

- 1. Clock Internal [1306]
- 2. Clock External [1307]
- 3. Clock Frequency SADC [1314]
- 4. Clock Frequency CDDA [1315]

DAC Mode Menu

- 1. Mode CDDA [1310]
- 2. Mode DVD48 [1311]
- 3. Mode DVD96 [1312]
- 4. Mode DSD [1313]

DAC Filter Menu

- 1. Filter SADC [1304]
- 2. Filter Non-SADC [1305]

DAC IIC Menu

- 1. I2C Test [1300]
- 2. I2C Enable Pin On [1301]
- 3. I2C Enable Pin Off [1302]

DAC Mute Menu

- 1. Mute On [1308]
- 2. Mute Off [1309]

Digital Board Menu

- 1. Furore →
- 2. Host Decoder →
- 3. Miscellaneous →

Furore Menu

- 1. SDRAM Write/Read High [1201]
- 2. SDRAM Write/Read Low [1200]
- 3. SDRAM Write/Read Fast High [1203]
- 4. SDRAM Write/Read Fast Low [1202]
- 5. Version [1204]

Host Decoder Menu

- 1. Audio Mute →
- 2. Centre On Stereo →
- 3. Colourbar →
- 4. De-Emphasis →

- 5. Pink Noise →
- 6. Sine Generate →
- 7. Digital Board Version [108]
- 8. Flash Checksum [100]
- 9. Flash1 Write Access [101]
- 10. Flash2 Write Access [102]
- 11. Flash Write/Read [103]
- 12. Host SDRAM Write/Read [104]
- 13. Host SDRAM Write/Read Fast [105]
- 14. Host DRAM Write/Read [106]
- 15. Host DRAM Write/Read Fast [107]
- 16. NVRAM I2C [123]
- 17. NVRAM Write/Read [122]

Audio Mute Menu

- 1. Audio Mute On [109]
- 2. Audio Mute Off [110]

Centre On Stereo Menu

- 1. Centre-On-Stereo Pin On [113]
- 2. Centre-On-Stereo Pin Off [114]

Colourbar Menu

- 1. Colourbar On [120]
- 2. Colourbar Off [121]

De-Emphasis Menu

- 1. De-Emphasis On [111]
- 2. De-Emphasis Off [112]

Pink Noise Menu

- 1. Pink Noise On [115]
- 2. Pink Noise On Channel 1 [124]
- 3. Pink Noise On Channel 2 [125]
- 4. Pink Noise On Channel 3 [126]
- 5. Pink Noise On Channel 4 [127]
- 6. Pink Noise On Channel 5 [128]
- 7. Pink Noise On Channel 6 [129]
- 8. Pink Noise Off [116]

Sine Generate Menu

- 1. Sine On [117]
- 2. Sine Burst 1kHz [118]
- 3. Sine Burst 12kHz [119]

Miscellaneous Menu

- 1. Clock 11.289 MHz [1400]
- 2. Clock 12.288 MHz [1401]
- 3. Clock 24.576 MHz [1402]
- 4. Colour Setup I2C [1403]
- 5. Colour Setup High [1404]
- 6. Colour Setup Low [1405]
- 7. Colour Setup Normal [1406]
- 8. Scart Pin Low [1410]
- 9. Scart Pin Medium [1411]
- 10. Scart Switch I2C [1407]
- 11. Scart Switch DVD [1408]
- 12. Scart Switch Pass [1409]

Front Panel Menu

- 1. Echo [500]
- 2. Dimmer [618]
- 3. Light Labels [503]
- 4. Led Test [504]
- 5. Keyboard [506]
- 6. Remote Control [506]
- 7. Segment Test [502]

Log Menu

- 1. Application Version Read [406]
- 2. Error Log Read [404]
- 3. Error Log Reset [407]
- 4. Lifetime Log Read [405]

5.4 Nuclei Error Codes

In the following tables the error description of the error codes will be described.

5.4.1 Host Decoder Nuclei

Error code	Error description
10000	Test succeeded.
10001	Test failed, checksum is wrong.
10100	Test succeeded.
10101	FLASH 1 Write access test failed.
10200	Test succeeded.
10201	FLASH 2 Write access test failed.
10300	Test succeeded.
10301	FLASH write test failed.
10302	FLASH write command failed.
10303	FLASH write test done max. number of times.
10400	Memory tests succeeded.
10401	Memory databus test goes wrong at wire dy.
10402	Memory addressbus test goes wrong at wire ay.
10403	Physical memory device test goes wrong at address 0xYYYYYYYY.
10500	Memory tests succeeded.
10501	Memory databus test goes wrong at wire dy.
10502	Memory addressbus test goes wrong at wire ay.
10503	Physical memory device test goes wrong at address 0xYYYYYYYY.
10600	Memory tests succeeded.
10601	Memory databus test goes wrong at wire dy.
10602	Memory addressbus test goes wrong at wire ay.
10603	Physical memory device test goes wrong at address 0xYYYYYYYY.
10700	Memory tests succeeded.
10701	Memory databus test goes wrong at wire dy.
10702	Memory addressbus test goes wrong at wire ay.
10703	Physical memory device test goes wrong at address 0xYYYYYYYY.
10800	Test succeeded.
10900	Test succeeded.
10901	Muting audio test failed.
11000	Test succeeded.
11001	Demuting audio test failed.
11100	Test succeeded.
11200	Test succeeded.
11300	Test succeeded.
11400	Test succeeded.

Error code	Error description
11500	Test succeeded.
11501	Set-up of I2C failed.
11502	The selection of the clock source failed.
11504	The demute of the audio failed.
11600	Test succeeded.
11601	Set-up of I2C failed.
11602	The mute of the audio failed.
11700	Test succeeded.
11701	Set-up of I2C failed.
11702	The mute of the audio failed.
11703	The demute of the audio failed.
11704	The selection of the clock source failed.
11707	Set-up of front panel failed.
11708	Front panel keyboard access failed.
11800	Test succeeded.
11801	Set-up of I2C failed.
11802	The mute of the audio failed.
11803	The demute of the audio failed.
11804	The selection of the clock source failed.
11900	Test succeeded.
11901	Set-up of I2C failed.
11902	The mute of the audio failed.
11903	The demute of the audio failed.
11904	The selection of the clock source failed.
12000	Test succeeded.
12100	Test succeeded.
12200	Test succeeded.
12201	I2C bus busy before start.
12202	NVRAM I2C access time-out.
12203	No NVRAM I2C access acknowledge.
12204	NVRAM I2C access time-out.
12205	NVRAM I2C Write/Read back failed.
12300	Test succeeded.
12301	I2C bus busy before start.
12302	NVRAM I2C read access time-out.
12303	No NVRAM I2C read acknowledge.
12304	NVRAM I2C read failed.
12400	Test succeeded.
12401	Test failed.
12500	Test succeeded.
12501	Test failed.
12600	Test succeeded.
12601	Test failed.
12700	Test succeeded.
12701	Test failed.
12800	Test succeeded.
12801	Test failed.
12900	Test succeeded.
12901	Test failed.

5.4.2 NVRAM Nuclei

Error code	Error description
40000	Test succeeded.
40001	I2C access failed.
40100	Test succeeded.
40101	I2C access failed.
40102	Invalid input.
40200	Test succeeded.
40201	I2C access failed.
40202	Invalid input.
40400	Test succeeded.
40401	I2C access failed.
40402	Errorlog in NVRAM is corrupt.
40403	Front panel access failed.
40500	Test succeeded.
40501	I2C access failed.
40502	Front panel access failed.
40600	Test succeeded.
40601	I2C access failed.
40700	Test succeeded.
40701	I2C access failed.
40800	Test succeeded.
40801	I2C access failed.
40900	Test succeeded.
40901	I2C access failed.

5.4.3 Front Panel Nuclei

Error code	Error description
50000	Test succeeded.
50001	I2C bus busy.
50002	I2C read access time-out.
50003	No I2C read acknowledges.
50004	I2C read failed.
50005	I2C write access time-out.
50006	No I2C write acknowledges.
50007	I2C write failed.
50008	No echo response from front panel.
50100	Test succeeded.
50101	I2C connection failed.
50200	Test succeeded.
50201	I2C connection failed.
50202	Test failed.
50300	Test succeeded.
50301	I2C connection failed.
50302	Test failed.
50400	Test succeeded.
50401	I2C connection failed.
50402	Test failed.
50500	Test succeeded.
50501	I2C connection failed.

Error code	Error description
50502	Test failed.
50504	Not all keys were pressed.
50600	Test succeeded.
50601	I2C connection failed.
50602	Test failed.
51800	Test succeeded.
51806	I2C connection failed.
51807	Test failed.

5.4.4 Basic Engine Nuclei

Error code	Error description
60000	Test succeeded.
60100	Test succeeded.
60101	Basic Engine returned error number 0xXX.
60102	Parity error from Basic Engine to Serial.
60103	Communication time-out error.
60104	Unexpected response from Basic Engine.
60105	Echo loop could not be closed.
60106	Wrong echo pattern received.
60200	Test succeeded.
60201	Basic Engine returned error number 0xXX.
60202	Parity error from Basic Engine to Serial.
60203	Communication time-out error.
60204	Unexpected response from Basic Engine.
60300	Test succeeded.
60301	Basic Engine time-out error.
60400	Test succeeded.
60401	Basic Engine returned error number 0xXX.
60402	Parity error from Basic Engine to Serial.
60403	Communication time-out error.
60404	Unexpected response from Basic Engine.
60405	Focus loop could not be closed.
60500	Test succeeded.
60501	Basic Engine returned error number 0xXX.
60502	Parity error from Basic Engine to Serial.
60503	Communication time-out error.
60504	Unexpected response from Basic Engine.
60600	Test succeeded.
60601	Basic Engine returned error number 0xXX.
60602	Parity error from Basic Engine to Serial.
60603	Communication time-out error.
60604	Unexpected response from Basic Engine.
60700	Test succeeded.
60701	Basic Engine returned error number 0xXX.
60702	Parity error from Basic Engine to Serial.
60703	Communication time-out error.
60704	Unexpected response from Basic Engine.
60800	Test succeeded.
60801	Basic Engine returned error number 0xXX.
60802	Parity error from Basic Engine to Serial.
60803	Communication time-out error.
60804	Unexpected response from Basic Engine.
60805	Radial loop could not be closed.

Error code	Error description
60900	Test succeeded.
60901	Basic Engine returned error number 0xXX.
60902	Parity error from Basic Engine to Serial.
60903	Communication time-out error.
60904	Unexpected response from Basic Engine.
61000	Test succeeded.
61001	Basic Engine returned error number 0xXX.
61002	Parity error from Basic Engine to Serial.
61003	Communication time-out error.
61004	Unexpected response from Basic Engine.
61100	Test succeeded.
61101	Basic Engine returned error number 0xXX.
61102	Parity error from Basic Engine to Serial.
61103	Communication time-out error.
61104	Unexpected response from Basic Engine.
61200	Test succeeded.
61201	Basic Engine returned error number 0xXX.
61202	Parity error from Basic Engine to Serial.
61203	Communication time-out error.
61204	Unexpected response from Basic Engine.
61300	Test succeeded.
61301	Basic Engine returned error number 0xXX.
61302	Parity error from Basic Engine to Serial.
61303	Communication time-out error.
61304	Unexpected response from Basic Engine.
61400	Test succeeded.
61401	Basic Engine returned error number 0xXX.
61402	Parity error from Basic Engine to Serial.
61403	Communication time-out error.
61404	Unexpected response from Basic Engine.
61500	Test succeeded.
61501	Basic Engine returned error number 0xXX.
61502	Parity error from Basic Engine to Serial.
61503	Communication time-out error.
61504	Unexpected response from Basic Engine.
61600	Test succeeded.
61601	Basic Engine returned error number 0xXX.
61602	Parity error from Basic Engine to Serial.
61603	Communication time-out error.
61604	Unexpected response from Basic Engine.
63500	Test succeeded.
63501	Basic Engine returned error number 0xXX.
63502	Parity error from Basic Engine to Serial.
63503	Communication time-out error.
63504	Unexpected response from Basic Engine.
63600	Test succeeded.
63601	Basic Engine returned error number 0xXX.
63602	Parity error from Basic Engine to Serial.
63603	Communication time-out error.
63604	Unexpected response from Basic Engine.
63700	Test succeeded.
63701	Basic Engine returned error number 0xXX.
63702	Parity error from Basic Engine to Serial.

Error code	Error description
63703	Communication time-out error.
63704	Unexpected response from Basic Engine.

5.4.5 Furore Nuclei

Error code	Error description
120000	Test succeeded.
120001	Memory databus test goes wrong at wire dy.
120002	Memory addressbus test goes wrong at wire ay.
120003	Physical memory device test goes wrong at address 0xYYYYYYYY.
120100	Test succeeded.
120101	Memory databus test goes wrong at wire dy.
120102	Memory addressbus test goes wrong at wire ay.
120103	Physical memory device test goes wrong at address 0xYYYYYYYY.
120200	Test succeeded.
120201	Memory databus test goes wrong at wire dy.
120202	Memory addressbus test goes wrong at wire ay.
120203	Physical memory device test goes wrong at address 0xYYYYYYYY.
120300	Test succeeded.
120301	Memory databus test goes wrong at wire dy.
120302	Memory addressbus test goes wrong at wire ay.
120303	Physical memory device test goes wrong at address 0xYYYYYYYY.
120400	Test succeeded.

5.4.6 DAC Nuclei

Error code	Error description
130000	Test succeeded.
130001	I2C bus busy before start.
130011	I2C I/O expander bus busy.
130012	I2C I/O expander read access time-out.
130013	I2C I/O expander no read acknowledge.
130014	I2C I/O expander read failed.
130015	I2C I/O expander write access time-out.
130016	I2C I/O expander no write acknowledge.
130017	I2C I/O expander write failed.
130018	I2C I/O expander failed.
130021	I2C DAC_LR device bus busy.
130022	I2C DAC_LR device read access time-out.
130023	I2C DAC_LR device no read acknowledge.
130024	I2C DAC_LR device read failed.
130025	I2C DAC_LR device write access time-out.
130026	I2C DAC_LR device no write acknowledge.
130027	I2C DAC_LR device write failed.
130028	I2C DAC_LR device failed.
130031	I2C DAC_LSRS device bus busy.
130032	I2C DAC_LSRS device read access time-out.
130033	I2C DAC_LSRS device no read acknowledge.

Error code	Error description
130034	I2C DAC_LSRS device read failed.
130035	I2C DAC_LSRS device write access time-out.
130036	I2C DAC_LSRS device no write acknowledge.
130037	I2C DAC_LSRS device write failed.
130038	I2C DAC_LSRS device failed.
130041	I2C DAC_CLFE device bus busy.
130042	I2C DAC_CLFE device read access time-out.
130043	I2C DAC_CLFE device no read acknowledge.
130044	I2C DAC_CLFE device read failed.
130045	I2C DAC_CLFE device write access time-out.
130046	I2C DAC_CLFE device no write acknowledge.
130047	I2C DAC_CLFE device write failed.
130048	I2C DAC_CLFE device failed.
130100	Test succeeded.
130200	Test succeeded.
130300	Test succeeded.
130301	I2C bus busy before start.
130302	I2C access failed.
130400	Test succeeded.
130401	I2C bus busy before start.
130402	I2C access failed.
130500	Test succeeded.
130501	I2C bus busy before start.
130502	I2C access failed.
130600	Test succeeded.
130601	I2C bus busy before start.
130602	I2C access failed.
130700	Test succeeded.
130701	I2C bus busy before start.
130702	I2C access failed.
130800	Test succeeded.
130801	I2C bus busy before start.
130802	I2C access failed.
130900	Test succeeded.
130901	I2C bus busy before start.
130902	I2C access failed.
131000	Test succeeded.
131001	I2C bus busy before start.
131002	I2C access failed.
131100	Test succeeded.
131101	I2C bus busy before start.
131102	I2C access failed.
131200	Test succeeded.
131201	I2C bus busy before start.
131202	I2C access failed.

Error code	Error description
131300	Test succeeded.
131301	I2C bus busy before start.
131302	I2C access failed.
131400	Test succeeded.
131401	I2C bus busy before start.
131402	I2C access failed.
131500	Test succeeded.
131501	I2C bus busy before start.
131502	I2C access failed.

5.4.7 Miscellaneous Nuclei

Error code	Error description
140000	Test succeeded.
140001	I2C access failed.
140100	Test succeeded.
140101	I2C access failed.
140200	Test succeeded.
140300	Test succeeded.
140301	I2C bus busy.
140302	I2C device write access time-out.
140303	I2C device no write acknowledge.
140304	I2C device write failed.
140400	Test succeeded.
140401	I2C bus busy before start.
140402	I2C access failed.
140403	Setup of SCART switch failed.
140500	Test succeeded.
140501	I2C bus busy before start.
140502	I2C access failed.
140503	Setup of SCART switch failed.
140600	Test succeeded.
140601	I2C bus busy before start.
140602	I2C access failed.
140603	Setup of SCART switch failed.
140700	Test succeeded.
140701	I2C bus busy.
140702	I2C device read access time-out.
140703	I2C device no read acknowledge.
140704	I2C device read failed.
140800	Test succeeded.
140801	Setup of ColourSetup chip failed.
140802	I2C device write failed.
140900	Test succeeded.
140901	Setup of ColourSetup chip failed.
140902	I2C device write failed.
140903	I2C device read failed.
141000	Test succeeded.
141100	Test succeeded.

5.5 Test instructions SACD mono board

5.5.1 General

- Impedance of measuring-equipment should be > 1M Ω .
- Most tests have to be done by software commands. Together with the software command you will find a Ref.# nbr. This is the number of the diagnostic nucleus used for this test. More detailed information can be found in the description of the command mode interface.
- Levels: Most measurements are digital measurements. The high and low levels in this document got to have next specification: low : < 0.3V (LVTTTL) high : > 3.0V (LVTTTL) LOW : < 0.4V (TTL) HIGH : > 4.5V (TTL)
- All voltages marked with "stby" have to stay on during standby.
- Because all clocks are derived from the SACD clock (384FS_in) from the DAC board, this board should always be connected to the mono board.
- The linear power supply is switched on/off by the STB_OUT signal from the mono board to the DAC board.

5.5.2 General start-up measurements

Supply check:

Measure the voltages on the pins of the connector 1600 with a multimeter.

pin	TP	Signal_name	Voltage
1600-1	F604	+3V3	+3V3
1600-2	F604	+3V3	+3V3
1600-3	F631	+5V	+5V (0V during standby)
1600-4	F614	+5Vstby	+5V
1600-5	F615	+6Vstby	+6V
1600-6	F623	GND	0V
1600-7	F623	GND	0V
1600-8	F623	GND	0V
1600-9	F618	-8Vstby	-8V
1600-10	F634	STB_CONT	0V (+5V during standby)
1600-11	F636	+12Vstby	+12V
1600-12	F623	GND	0V
1600-13	F675	PWR_FAIL	+2.1V (1.4V during standby)

Also check the following power supplies:

Testpoint F608: +3V3 (5%. (Check IC7605 in case of failure)
 Testpoint F632: +3V3 (5%. (Check IC7622 in case of failure)
 Testpoint F101: +9V (5%. (Check IC7109 in case of failure)

Check the supply currents to be sure that there are no major failures on the board.

Measure the currents flowing toward the mono board using a Tektronix AM503B current probe on the wires between the switch mode power supply and the connector 1600.

pin	TP	Signal_name	measured
1600-1	F605	+3V3	560 mA
1600-2	F605	+3V3	
1600-3	F631	+5V	510 mA
1600-4	F614	+5Vstby	2 mA
1600-5	F615	+6Vstby	< 1 mA
1600-6	F623	GND	
1600-7	F623	GND	
1600-8	F623	GND	
1600-9	F618	-8Vstby	54 mA
1600-10	F634	STB_CONT	
1600-11	F636	+12Vstby	90 mA
1600-12	F623	GND	
1600-13	F675	PWR_FAIL	

5.5.3 Reset circuitry

Reset of Sti5505:

In power down mode STB_CONT is high; the clock is disabled in order to reduce the power consumption. When STB_CONT goes low, STB_CONTD goes high and enables the 27 MHz clock.

Check that this clock is present and stable before the RESETn is de-asserted. RESETn is a signal, which allows initialising the main processor. We check also that when going from ON mode to stand-by mode, the 27 MHz is held for a certain moment after RESETn is asserted.

Reset of Servo:

The reset for the Servo circuit is given on Power On to the MACE IC 7207 with POR via C2215, R3234 and D6200. The reset signals STB_DALAS for DALAS and PORn for HD61 are generated by MACE IC.

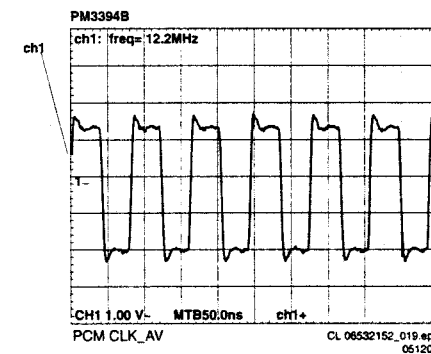
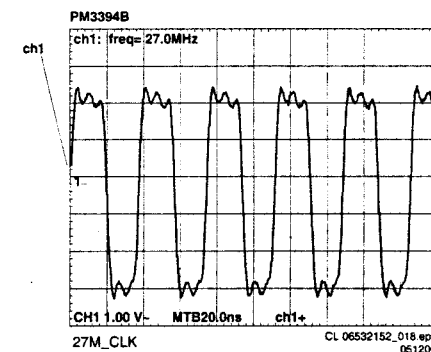
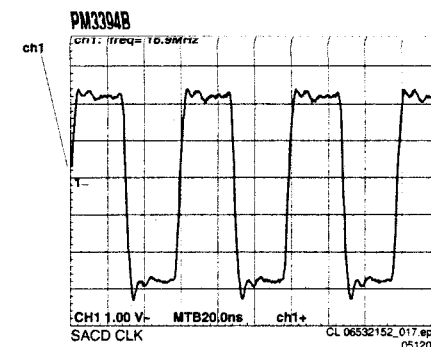
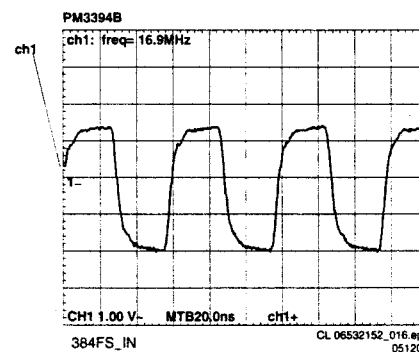
When POR is not working (due to a hang-up situation), an extra reset signal RSTN, coming from the Sti5505 will wake up the Servo circuit.

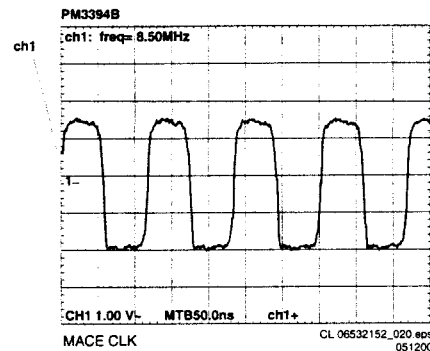
5.5.4 Clock check

The source clock comes from the DAC board. The SACD CLK is a master clock from which all the other clocks are derived. If this one is not present the system cannot start and work.

The SACD power supply, the mono board and the DAC board should be connected together. On power up the clocks appear on the board. All clocks to be measured have a 0.02% tolerance.

Clockname	Test point	Frequency / level
384Fs_in	F911	16.9344 MHz / 3V3
SACD_CLK	F903	16.9344 MHz / 5V
27M_CLK	F503	27MHz / 5V
PCMCLK_AV	F640	12.288MHz / 3V3
MACE CLOCK	F211	8.46 MHz / 3V3





5.5.5 Tests with diagnostic software program

The SACD diagnostic program is included in the SACD application software. This program permits to test a lot of functions of the PCB. We group in this part the memory tests, the general serial bus tests and the peripheral tests of the mono board.

Start up

Conditions

The units required are the SACD power supply, the mono board and the DAC board. This is the minimum set up for the diagnostic program, when testing memories and peripherals. When using the Compair serial cable, pin 1602-2 is directly connected to GND and after powering on, the diagnostic program will be started.

The other end of the service cable is connected to a PC serial port. On the PC you need to open an HyperTerminal and configure it as follows: 19200 b/s, 8 bits data, no parity, 1 stop bit, no control flow.

Start the diagnostic

When you switch on, the diagnostic checks the serial port in both directions, followed by few other commands. Those are done automatically during power up. The following message is displayed on the HyperTerminal: "SACD1000 Diagnostic Software version ...". Then the program is waiting that you select a mode. Getting this screen means the STi5505 can boot from flash. The program is running and the service interface is functioning. Enter the mode you wish to use. You can use either the Menu mode or the Command mode. In the first mode, the main menu appears, you can navigate into the menu system and you can select the individual command, just type the corresponding number to launch it. In the second mode, just type the Ref.# number to do the test. When a Ref.# command is available in the diagnostic program, it will be explained as follow :

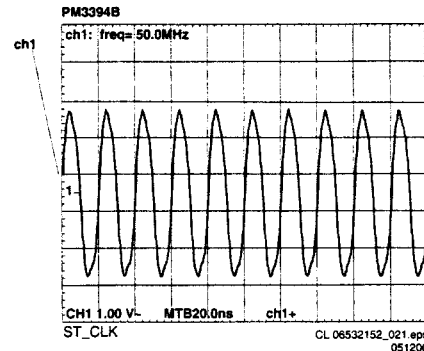
Ref.#	Command Name	Remark

At the end of the test, the diagnostic program will return "OK" if the test is passed. Otherwise an error message will appear.

System clock

ST_CLK is the system clock and is derived from the 27 MHz by the internal PLL of the STi5505 (pin137).

Name	Test point	Frequency	Level
ST_CLK	F822	49.95 MHz	TTL



Memories

Flashes

Read flash test:

If you can start the diagnostic that means you are able to read the flashes and the program is running. Then you can normally use the diagnostic program. At this moment you can launch the checksum calculation from the diagnostic program.

Ref.#	Command Name	Remark
100	Checksum FLASH	

If you don't encounter any problem during utilisation of the diagnostic program means the STi5505 is properly connected to the flashes.

SDRAM

Use the diagnostic program for a complete software test of the SDRAM.

Ref.#	Command Name	Remark
104	SDRAM Write	Extensive test
	Read	

I2C bus test

EEProm

To access the EEPROM, the I2C bus is used. So writing and reading back to the EEPROM check the chip and the bus.

Ref.#	Command Name	Remark
123	NVRAM I2C	Quick test - Write and read back

The complete EEPROM can also be checked but it takes a lot of time to write and read back at all the locations.

Ref.#	Command Name	Remark
122	NVRAM write read	Extensive test - Write and read-back

Display board

The mono board accesses to the display board through the I2C bus. You can test this serial bus up to the connector 1501. So connect the display board to the mono board and launch either the following command :

Ref.#	Command Name	Remark
500	Echo	Write and read back
501	version	Software version of the slave processor rom

S2B bus

The S2B is the interface between the digital part and the front end. This bus links the STi5505 and the MACE2. The S2B echo command permits to check the communication between those devices.

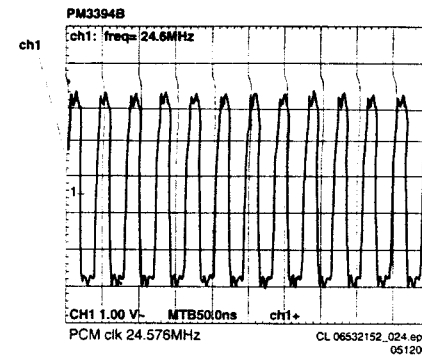
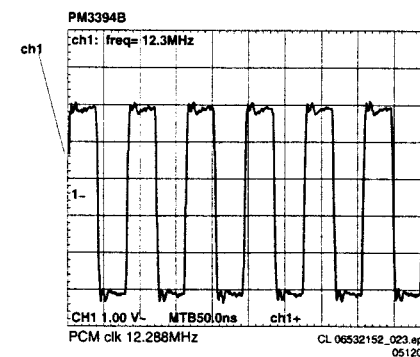
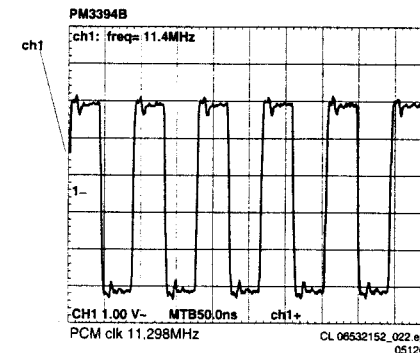
Ref.#	Command Name	Remark
601	S2b Echo	Write and read back

Peripherals

Audio clock select

This clock is derived from the SACD CLOCK by the mono board system clocks. The audio PCM_CLK can take 3 values. The STi5505 PIO's permit to select 3 different frequencies depending on the application. Check those frequencies on F566

Ref.#	Command Name	Frequency	SEL_AC LK2	SEL_AC LK1
1400	Clock	11.2896 MHz	0	1
1401	Clock	12.288 MHz	1	0
1402	Clock	24.576 MHz	1	1



Audio mute

Ref.#	Command Name	MUTE_AV at F625	Remark
109	Mute ON	+4.8V	Audio Mute On
110	Mute OFF	-8V	Audio Mute Off

Center on/Mono

Check whether we can switch between the mono mode and the stereo mode. Measure the level on F633.

Ref.#	Command Name	Center on	Remark
113	Centre-On-Stereo Pin On	3.3V	Mono
114	Centre-On-Stereo Pin Off	0V	Stereo

I2C DAC

Check whether you can enable or disable the I2C switch. When driving the I2C_DAC signal measure the corresponding level at F001.

Ref.#	Command Name	Level
1301	I2C enable	H = 5V
1302	I2C disable	L = 0V

Slow blanking

An additional part of the video-path is the scart-switching or slow blanking voltage. This voltage can be 0V, 6V. Check at F620 the output voltage with next commands:

Ref.#	Command Name	Remark	Level
1410	Scart Low	No picture	0V ± 0.5V
1411	Scart Medium	16/9 format	6V ± 10%

PCM Audio on I2S bus

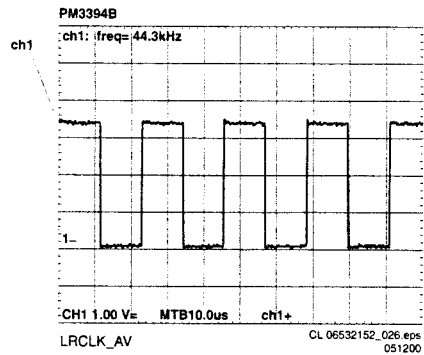
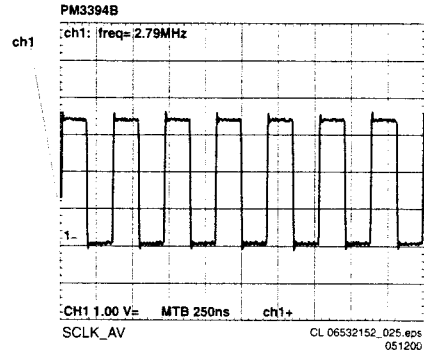
For this test connect the A/V board and the front panel to the monoboard. Don't forget to power up the front panel. The I2S audio signals are measured in 3 different situations: no audio, sine wave is played, pink noise is played.

No audio

Switch ON the power supplies and check these signals

Signal	Test point	type	Level	Frequency
SCLK_AV	F637	Clock	LVTTL	2.82MHz < 0.02%
LRCLK_AV	F641	Clock	LVTTL	44.1KHz < 0.02%
PCM_CLK_AV	F640	No signal	LVTTL	N/A
PCMOUT_AV	F638	No signal	LVTTL	N/A

Signal	Test point	type	Level	Frequency
PCM_Ce_Lf_Fur	F659	No signal	LVTTL	N/A
PCM_LsRs_Fur	F504	No signal	LVTTL	N/A
SPDIF	F644	Data stream	TTL	N/A

**Sine wave**

Generate the sine wave with the following command

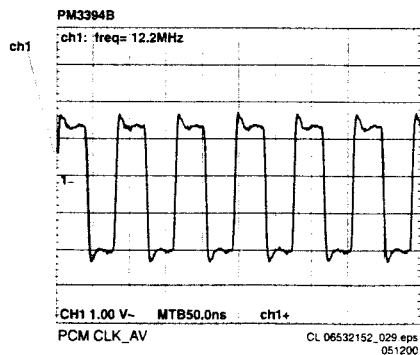
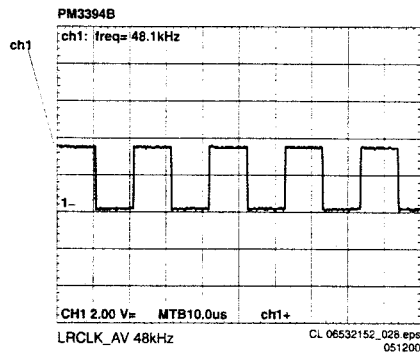
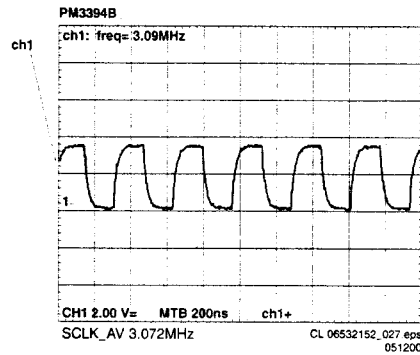
Ref.#	Command Name	Remark
117	Sine ON	Play the sine wave at the audio outputs

Then measure the following signals

Signal	Test point	type	Level	Frequency
SCLK_AV	F637	Clock	LVTTL	3.072MHz < 0.02%
LRCLK_AV	F641	Clock	LVTTL	48 kHz < 0.02%
PCMCLK_AV	F640	Clock	LVTTL	12.288 MHz < 0.02%
PCMOUT_AV	F638	Data stream	LVTTL	N/A
PCM_Ce_Lf_Fur	F659	No signal	LVTTL	N/A

Signal	Test point	type	Level	Frequency
PCM_LsRs_Fur	F504	No signal	LVTTL	N/A
SPDIF	F644	Data stream	TTL	N/A

Press "STOP" to switch off the sine wave.

**Pink noise**

Generate the pink noise with the following command

Ref.#	Command Name	Remark
115	Pink Noise ON	Play the pink noise at the audio outputs

Then measure the following signals

Signal	Test point	type	Level	Frequency
SCLK_AV	F637	Clock	LVTTL	3.072MHz < 0.02%
LRCLK_AV	F641	Clock	LVTTL	48 kHz < 0.02%
PCM_CLK_AV	F640	Clock	LVTTL	12.288 MHz < 0.02%
PCMOUT_AV	F638	Data stream	LVTTL	N/A
PCM_Ce_Lf_Fur	F659	Data stream	LVTTL	N/A
PCM_LsRs_Fur	F504	Data stream	LVTTL	N/A
SPDIF	F644	Data stream	TTL	N/A

5.5.6 Video

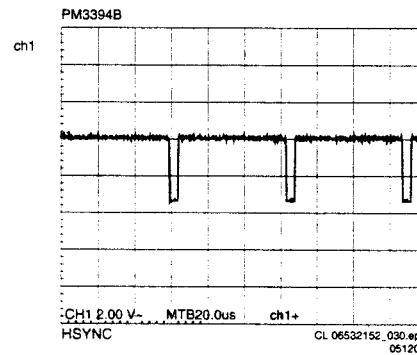
From the diagnostic program, play the 8 colour bar pattern.

Ref.#	Command Name	Remark
120	Colour bar On	8-color bar pattern
121	Colour bar Off	Disable the pattern

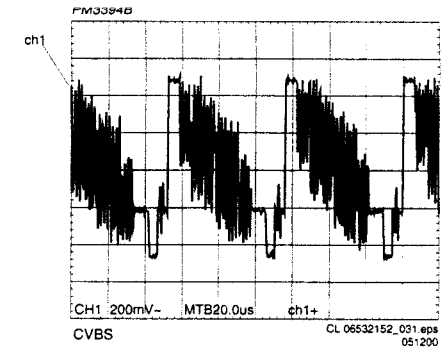
Video Hsync

Measure this output at F656

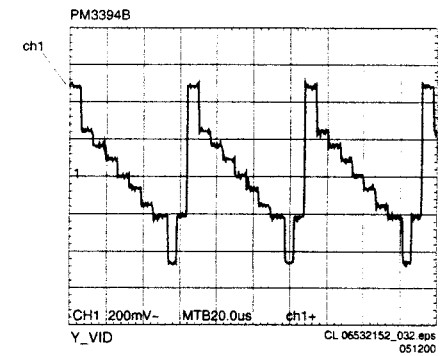
Ref.#	Command Name	Remark	Value
120	Colour bar On		15.625 kHz $\pm$ 0.02% Vpeak-peak > 3V

**Video signals****CVBS**

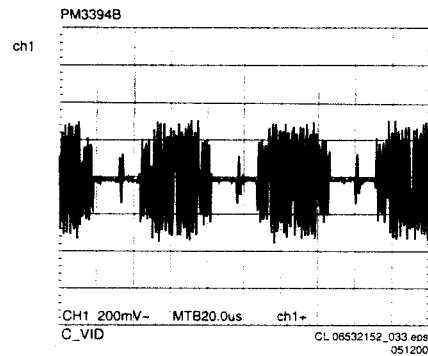
Measured at F657



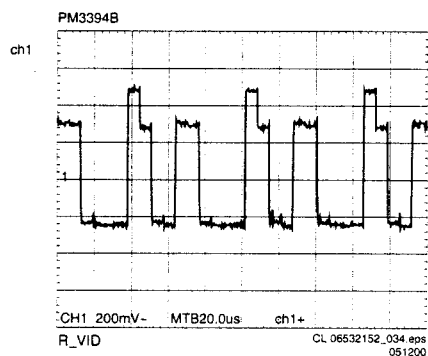
Luminance Y-VID
Measured at F662



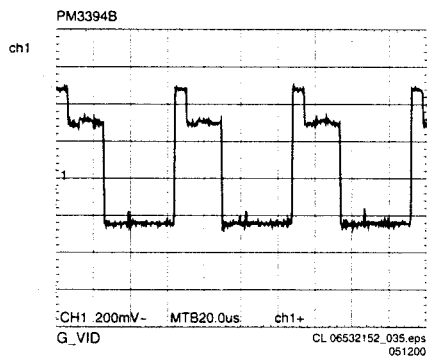
Chrominance C_VID
Measured at F665



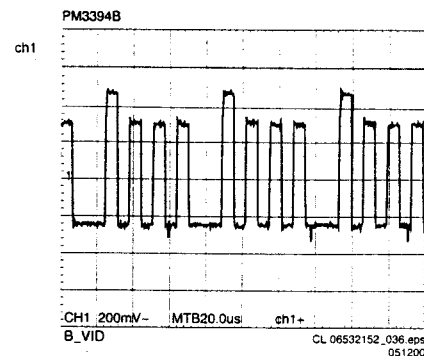
Red R_VID
Measured at F646



Green G_VID
Measured at F649



Blue B_VID
Measured at F653



Switch off the colour bar with the following command:

Ref.#	Command Name	Remark	Value
121	Colour bar Off	Disable the pattern	

SACD Processor/Furore

With the following commands, the access of the Furore and its SDRAM is checked.

Ref.#	Command Name	Remark
1204	DS_FURORE_Id	Check Furore ID
1200	DS_FURORE_Sdram WrRLow	Check full speed SDRAM
1201	DS_FURORE_Sdram WrRHigh	Check full speed SDRAM
1202	DS_FURORE_Sdram WrRLowFast	Check full speed SDRAM
1203	DS_FURORE_Sdram WrRHighFast	Check full speed SDRAM

RF signal amplitude

This signal is measured at F851 just at the input of the Furore. When no disc is in the player, we measured 54 mV. Then a disc is inserted and played, at this moment the RF signal increases. We measured 1.05 V amplitude and the level of this input should be between 0.2V and 1.5 V. Then we can play normally a SACD disc.

DSD outputs

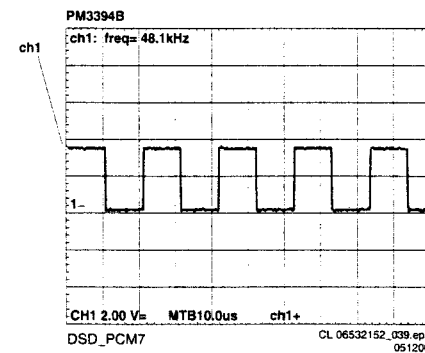
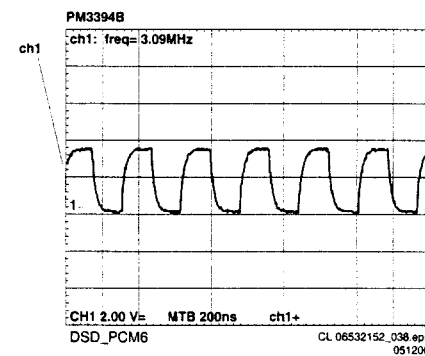
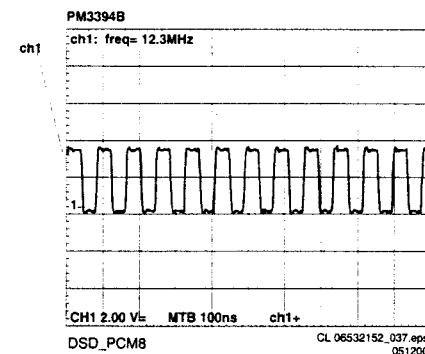
With the diagnostic software, we can partially test the DSD_PCM bus toward the DAC board. When you play a pink noise, digital bit stream is coming out of the Furore and is fed to the DAC board.

Ref.#	Command Name	Remark
115	Pink Noise ON	Play the pink noise at the audio outputs

Measure the following signals

Signal	Test point	type	Level	Frequency
DSD_PCM(8)	F002	Clock	LVTTL	12.288 MHz < 0.02%
DSD_PCM(6)	F003	Clock	LVTTL	3.072 MHz < 0.02%
DSD_PCM(7)	F004	Clock	LVTTL	48 kHz < 0.02%
DSD_PCM(0)	F005	Data stream	LVTTL	N/A

Signal	Test point	type	Level	Frequency
DSD_PCM(1)	F006	Signal : High	LVTTL	N/A
DSD_PCM(4)	F007	Data stream	LVTTL	N/A
DSD_PCM(5)	F008	Signal : High	LVTTL	N/A
DSD_PCM(2)	F009	Data stream	LVTTL	N/A
DSD_PCM(3)	F010	Signal : High	LVTTL	N/A



5.5.7 SERVO TESTS

General start-up measurements:

Reset the Basic Engine part

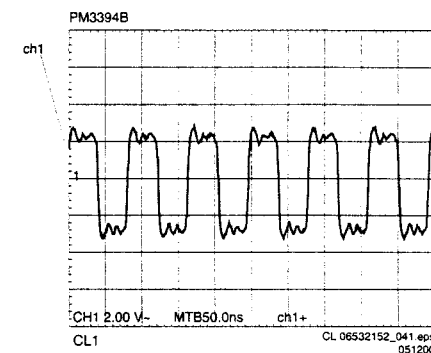
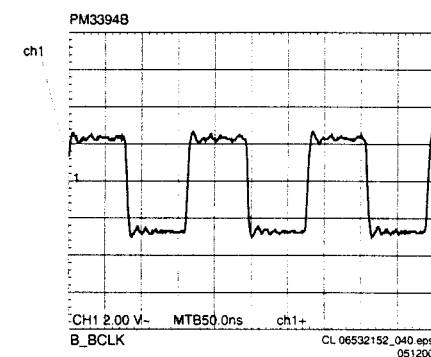
Ref. #	Command Name	Remark
603	BeReset	Reset Basic Engine

Check Vref

Name	Testpoint	Value
Vref	F188	2.5V +/- 0.3

Check I2S interface

Name	Testpoint	Value
B_BCLK	F347	6.0MHz +/- 0.1
CL1	F337	12.0MHz +/- 0.2
B_WCLK	F343	HIGH
Stopclk	F338	HIGH
B_Sync	F344	HIGH
B_V4	F348	HIGH



Disc Motor:

Before switching on the disc motor, check the following test points:

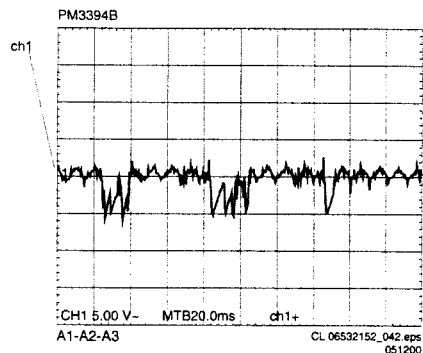
Name	Testpoint	Value
Stby	F357	high
Stby-out	F355	LOW
Moto1	F361	3V±0.3

Switch the Discmotor on/off with next commands:

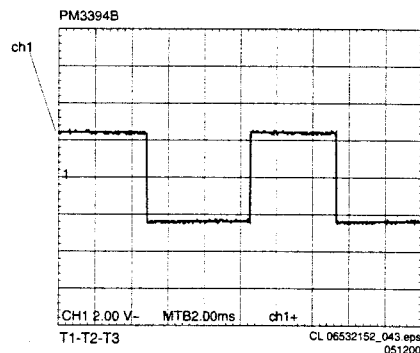
Ref. #	Command Name	Remark
606	BeDiscmotorOn	Discmotor on
607	BeDiscmotorOff	Discmotor off

Check the following signals when discmotor has been switched on:

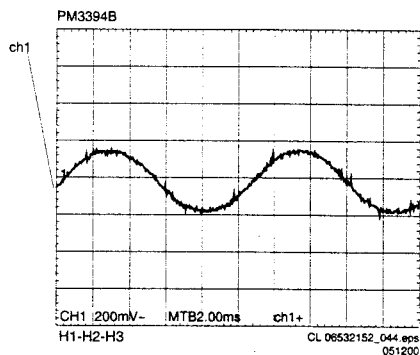
Name	Pin nr.	Frequency
Stby	F357	low
Stby-out	F355	HIGH
Moto1	F361	2V±0.5V
A3	F350	see oscillogram
A2	F352	see oscillogram
A1	F353	see oscillogram



T1	F280	see oscillogram
T2	No testpoint present	see oscillogram
T3	F371	see oscillogram



VH	F365	3V±0.5V
H1+	F354	see oscillogram
H1-	F359	see oscillogram
H2+	F364	see oscillogram
H2-	F366	see oscillogram
H3+	F367	see oscillogram
H3-	F370	see oscillogram



Switch the discmotor off.

Radial

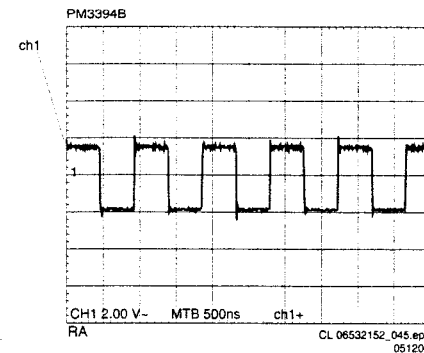
Switch the radial control on/off with the following commands:

Ref. #	Command Name	Remark
608	BeRadialOn	Radial control on
609	BeRadialOff	Radial control off

Check the following signals:

Check for pulse density signal RA at testpoint F227

Name	Testpoint	Value
Rad -	F128	4.3V±0.5V
Rad +	F121	4.3V±0.5V



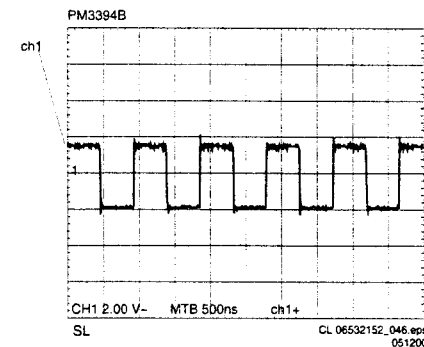
Check if laser is switched on (visual check of laserlight).
Switch the radial control off.

Sledge

Use the following commands to move the sledge:

Ref. #	Command Name	Remark
610	BeSledgeln	Sledge inwards
611	BeSledgeOut	Sledge outwards

Check pulse density signal SL at testpoint F221



Name	Testpoint	Value
Sl -	F039	4.5V±0.5V
Sl +	F038	4.5V±0.5V

Measure peak to peak signal on SL- and SL+ while moving sledge outwards.

Name	Testpoint	Value
Sl -	F039	10Vptp ±0.5
Sl +	F038	10Vptp ±0.5

Measure input sledge control (sledge in home position)

Name	Testpoint	Value
Sinph	F182	1.5V±0.5V
Cosph	F192	1.5V±0.5V

Tray:

To open and close the tray use the following commands:

Ref. #	Command Name	Remark
615	BeTrayIn	Tray in
616	BeTrayOut	Tray out

Measure the driver outputs of the BA5938FM for the tray closed.

Name	Testpoint	Value
Vo2 -	F116	4.3V±2.0V
Vo2 +	F111	4.3V±2.0V

Measure again the driver outputs while the tray is opening.

Name	Testpoint	Value
Vo2 -	F116	6.0V±1.0V
Vo2 +	F111	2.0V±1.0V

Measure again the driver outputs while the tray is closing

Name	Testpoint	Value
Vo2 -	F116	2.0V±1.0V
Vo2 +	F111	6.0V±1.0V

Focus

To switch the Focus motor on/off, use the following commands:

Ref. #	Command Name	Remark
604	BeFocusOn	Focus on
605	BeFocusOff	Focus off

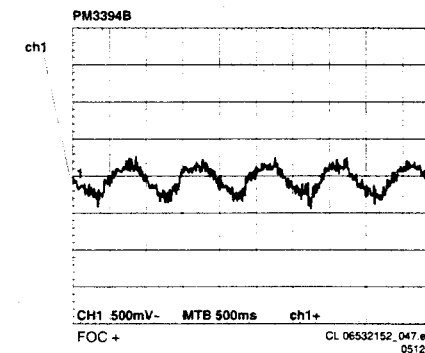
Measure the driver outputs of the BA5938FM for the Focus off.

Name	Testpoint	Value
Ioc -	F124	4.3V±0.5V
Ioc +	F127	4.3V±0.5V

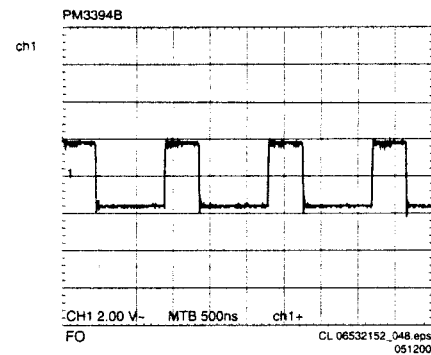
Switch the focus on

Measure again the driver outputs

Name	Testpoint	Value
Foc - (sawtooth)	F124	1V±0.2V
Foc + (sawtooth)	F127	1V±0.2V



Check for pulse density signal FO at testpoint F234



Check for laserlight.
Switch the focus off

Hf path

Play DVD test disc.

Measure outputs of diodes A, B, C, D, E, F.

Name	Testpoint	Value
A	F140	2.6V±0.2V
B	F141	2.6V±0.2V
C	F143	2.6V±0.2V
D	F144	2.6V±0.2V
E	F147	2.6V±0.2V
F	F148	2.6V±0.2V

Measure DVDALAS outputs

Name	Testpoint	Value
RFO DC	F146	2.5V ± 0.2V, eyepattern 1Vptp
O1	F155	25mV±10mV
O2	F158	25mV±10mV
O3	F168	25mV±10mV
O4	F165	25mV±10mV
S1	F174	25mV±10mV
S2	F175	25mV±10mV

5.6 Test instructions Display board

5.6.1 Display board

Introduction

These test instructions are written for all versions of the display PCB 3104 123 42230.

The contents of the PCB can be split up into next blocks:

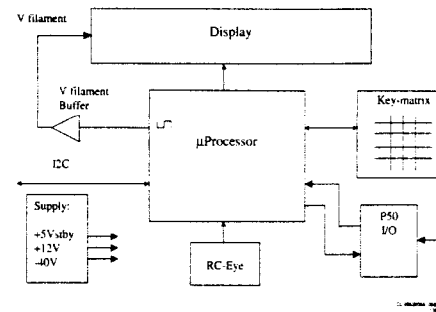


Figure 5-10

Functionality description:

The essential component of the display PCB is the uP (slave). This slave works on an 8MHz resonator and has a reset circuit that is triggered by the +5Vstby. After the reset pulse, the standby control line will release the reset of the host uP. This host uP will then initialise the slave. In addition, when going to stand-by, the slave will put the host uP in reset. When the slave receives the right IR or key code to leave the standby mode, the reset of the host uP will be released.

Other slave functions are:

- Square signal generator to generate the filament voltage, which is required for an AC FTD.
- Generates the grid and segment scanning for the FTD.
- Generates a scanning grid for the keys (separated from display scanning).
- Has inputs for RC (RC5 and RC6) and P50 (P50 controller is built in).

General

- Oscilloscope measurements have been carried out using a Philips PM3392A.
- Impedance of measuring-equipment should be > 1MΩ.
- To do correct measurements we recommend to use supply 3122 427 21370, which is used in all "second generation B" DVD-players. Make sure that the main 3.3V has a 0.7A load.

Reset

Check next reset timing with an oscilloscope at pin 10 of the processor.

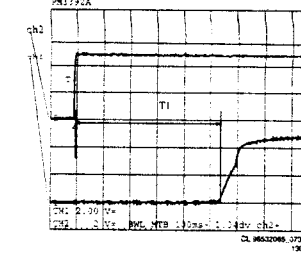


Figure 5-11

Timing: 400msec < T1 > 700msec.
CH1: +5Vstby voltage at power on.
CH2: Voltage at pin 10.

Display steering

Check next timing and level for all grid-lines (G1 r G14).

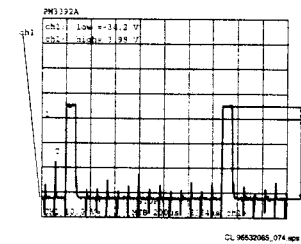


Figure 5-12

1. Check level A: +4V5 ±10% for grid lines 1 => 11
2. Check level A: +4V0 ±10% for grid lines 12 => 14
3. Check level B: -33V ±10%
4. Check timing and levels of segment-lines P1 r P10:

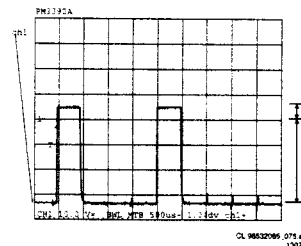


Figure 5-13

Level A: +4V5 ±10%

Level B: -33V ±10%

The data on these segment lines depend on the characters that are displayed.

The characters can be set by sending I2C commands to the display.

See the Slave URS how to send a display command.

Key-matrix

Connect a extra 10k(pull-up to pin 36 en 37 of the uP and check next matrix scanning at these pins.

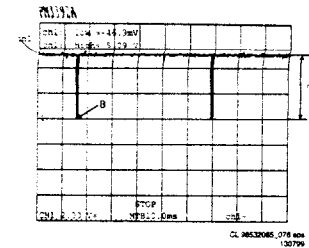


Figure 5-14

Level A: 5.0V ±7%

Level B: 0V ±200mV

Check matrix scanning from pin 26 until 33 of the uP. The results should be the same as the diagram above.

I.R. receiver

Check at pin 23 of the (P if this line switches from low (< 0.3V) to high (> 4.5V), while pressing a key on a Philips RC5 or RC6 remote control.

P50 interface

P50 is a bi-directional serial interface, which is used for communication between video equipment. For European sets, this communication goes via pin 10 of the scart-bus. In other regions, it can be a cinch bus at the back of the set.

1. Keep the uP in reset by short-circuiting emitter and collector of transistor 7108, via resistor 3100 and 3104 transistor 7101 is switched on.
2. Check the voltage at the P50 output connector 1118-5: < 200mV.

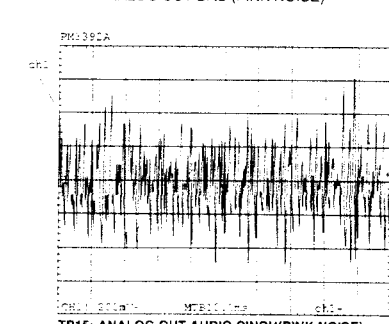
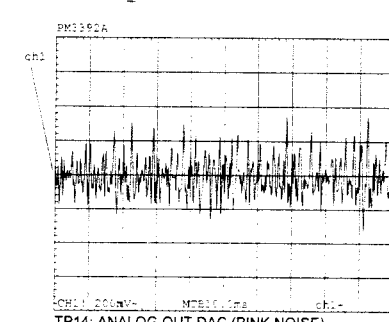
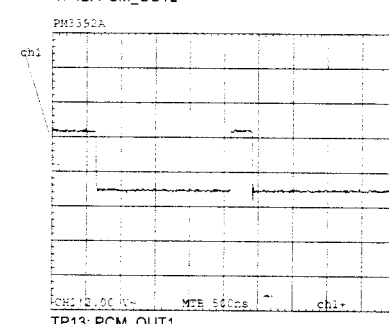
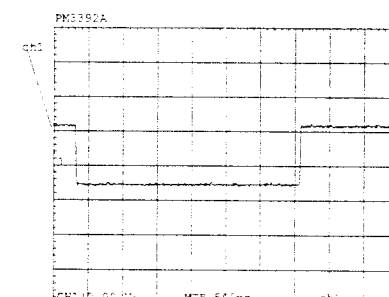
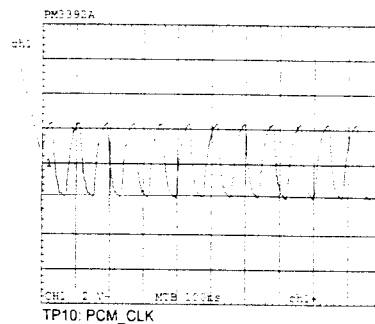
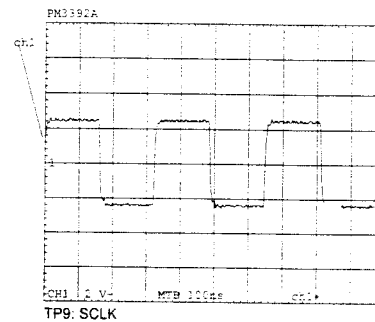
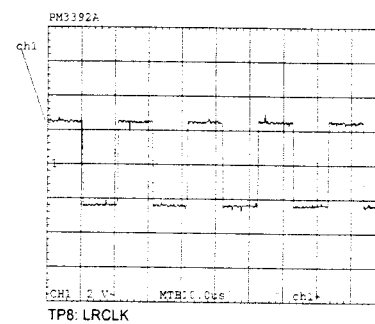
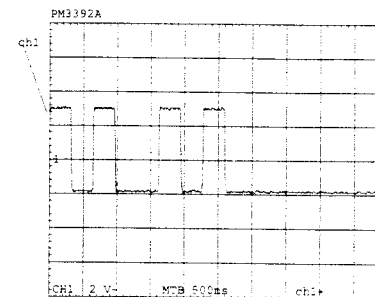
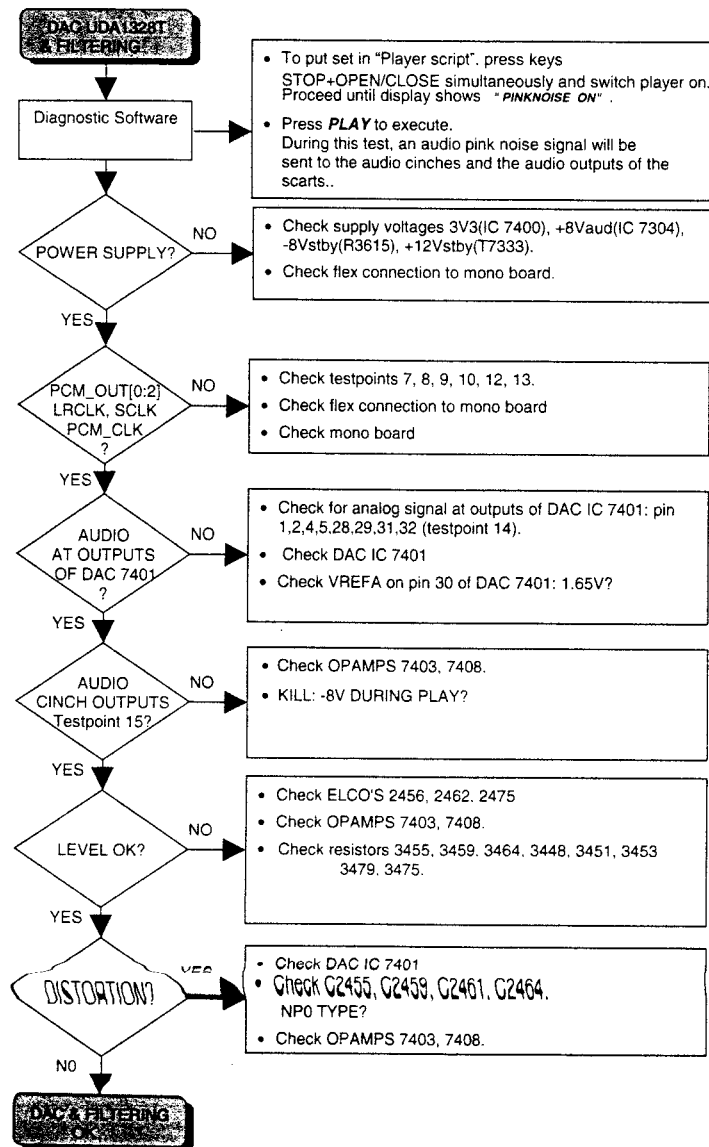
When the reset is released the uP output-pin becomes low and transistor 7101 is switched off.

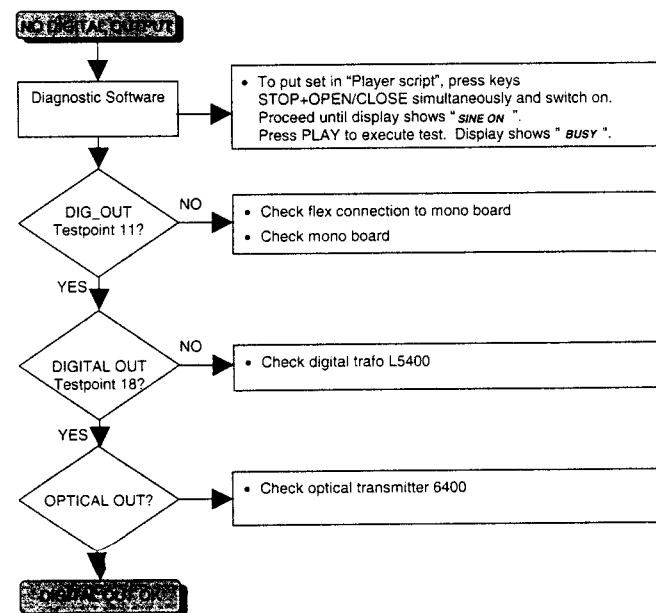
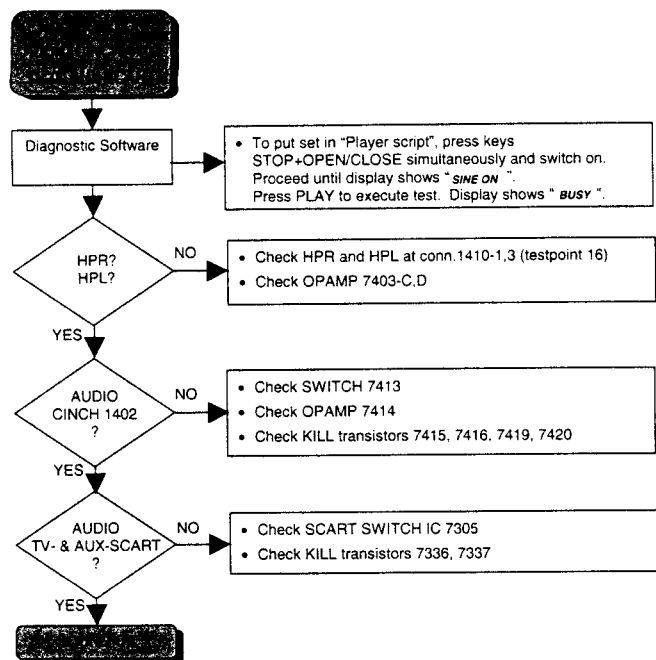
1. Check the voltage at the P50 output connector 1118-5: 4V9 ±5%.
2. Check also the uP P50 input (uP pin 20): 5V ±5%.
3. Connect the P50 line (connector 1118-5) to ground.
4. Check again the uP P50 input (uP pin 20): <0V3.

5.7 Trouble shooting AV Board

Testing of A/V board can be done using diagnostic software "Player script". Mono board is used to generate a sound with the sound tests PINKNOISE ON and SINE ON. A VIDEO signal is generated with COLOUR-B ON. Functional control of scart switching is also possible.

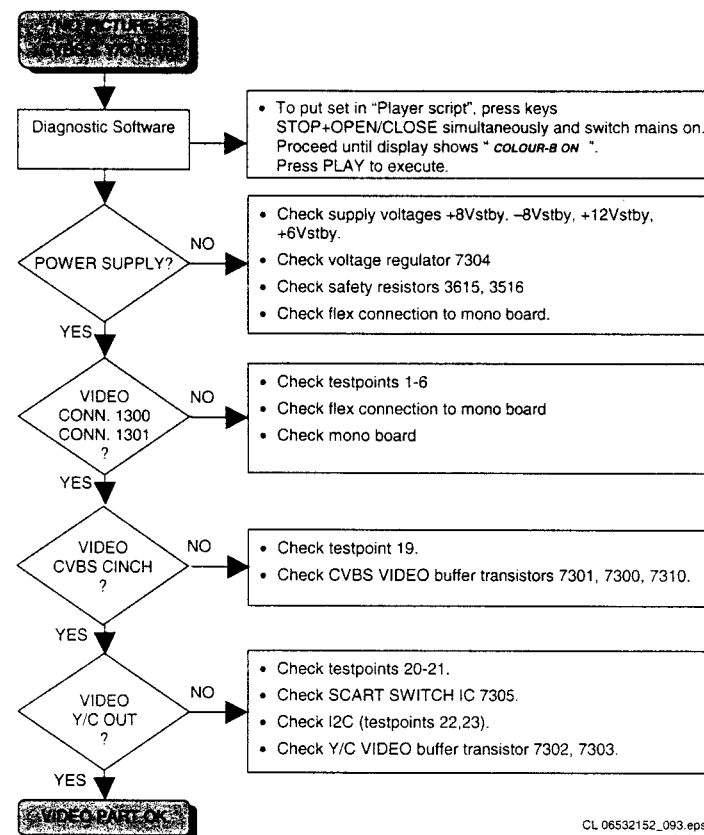
AUDIO PART



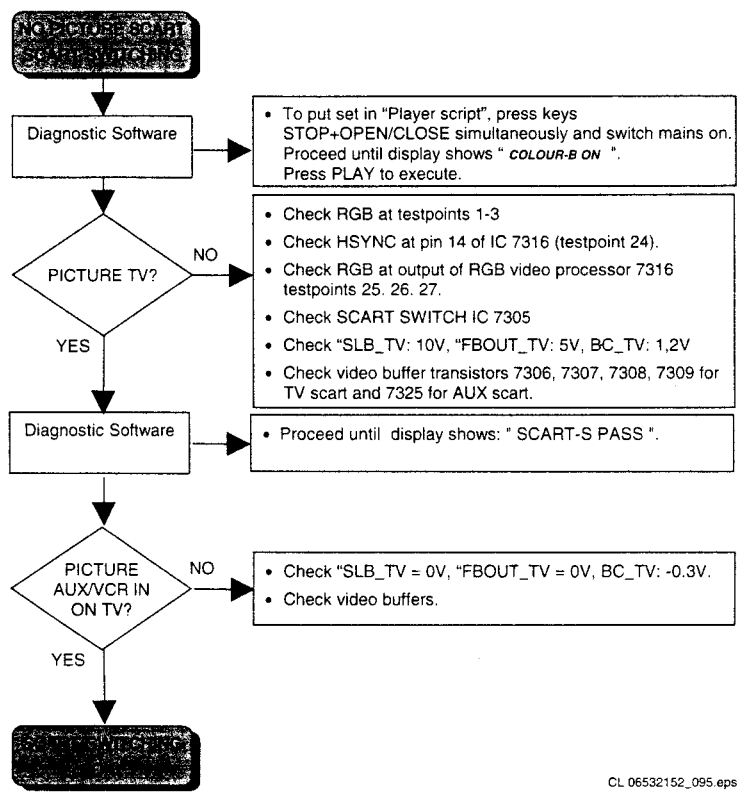
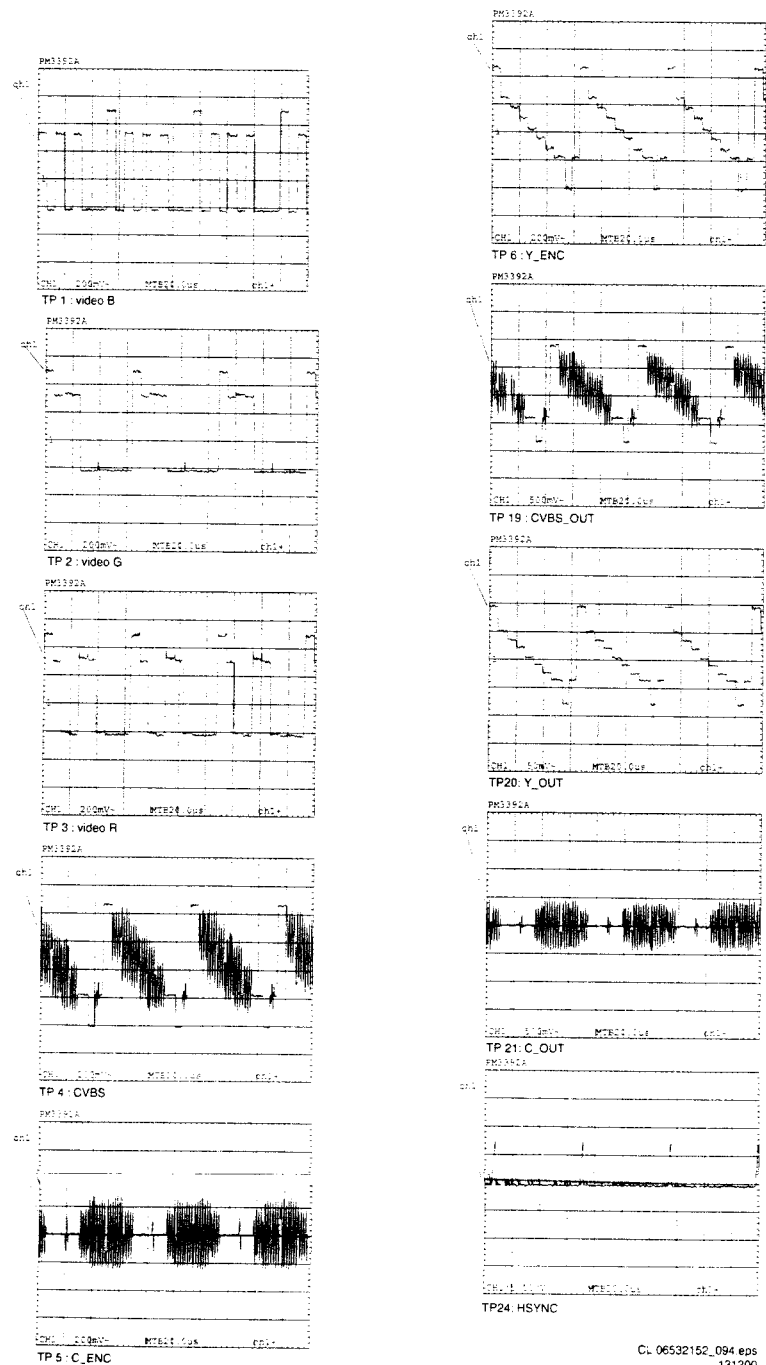


CL 06532152_092.eps
131200

VIDEO PART



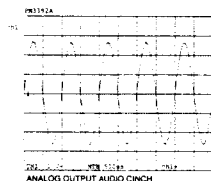
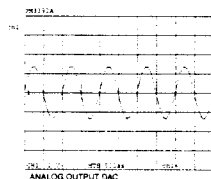
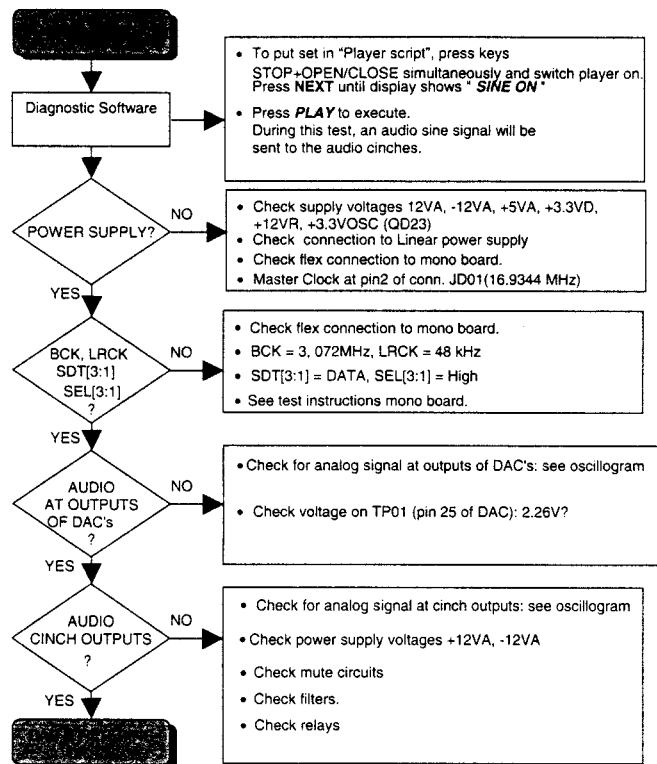
CL 06532152_093.eps
131200



5.8 Trouble shooting DAC Board

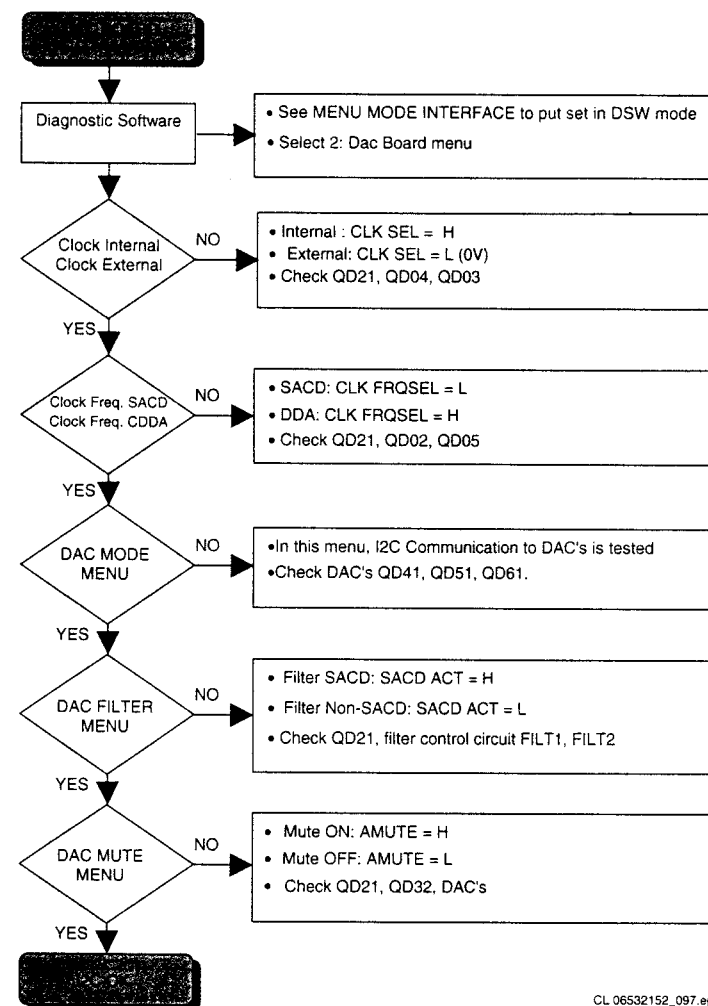
TROUBLESHOOTING DAC BOARD

Testing of DAC board can be done using diagnostic software "Player script". Mono board is used to generate a sound with the sound test SINE ON.



CL 06532152_095.eps
131200

Testing of I2C communication to DAC board can be done using diagnostic software.

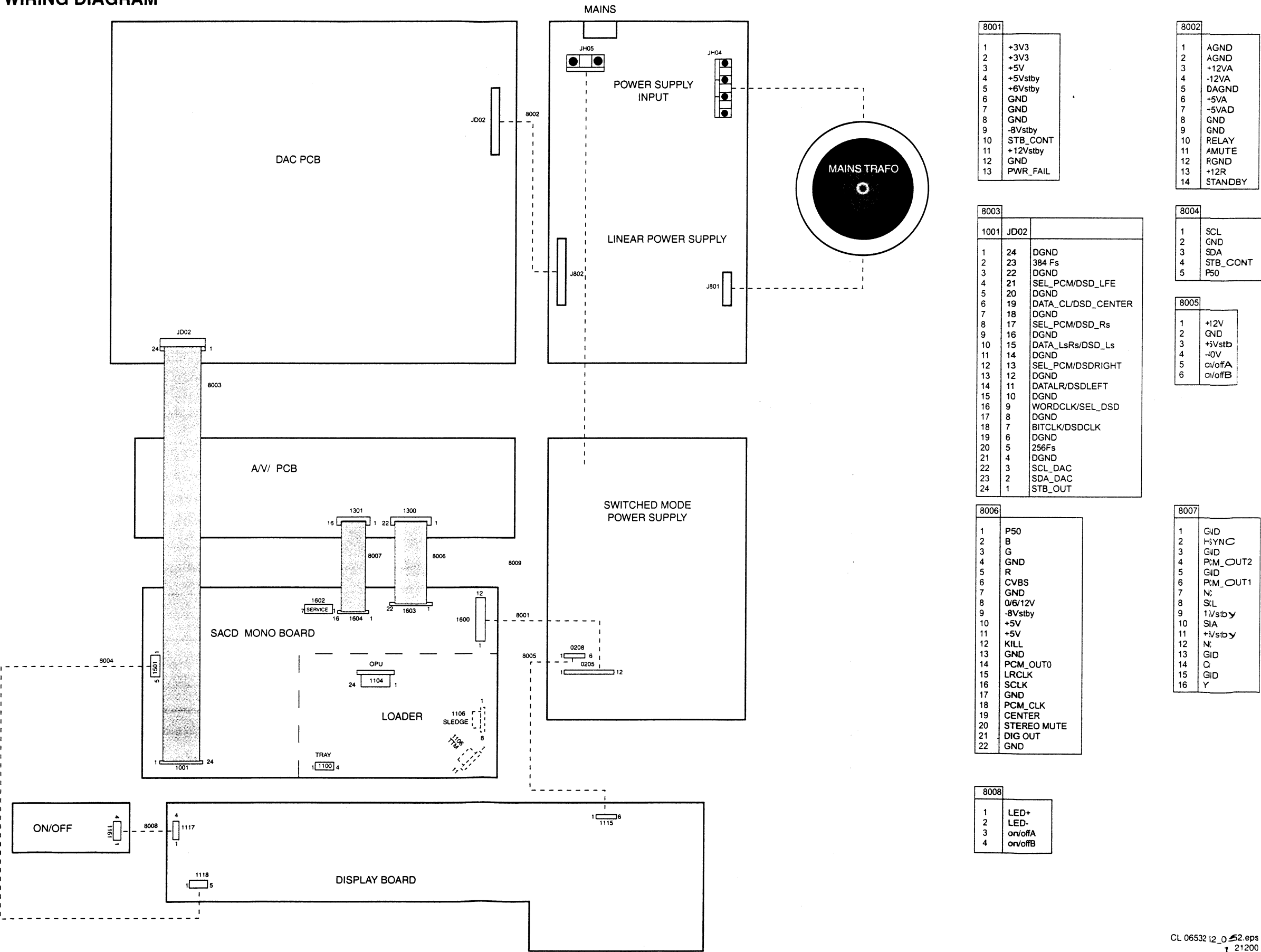


CL 06532152_097.eps
131200

6. Wiring and block diagram

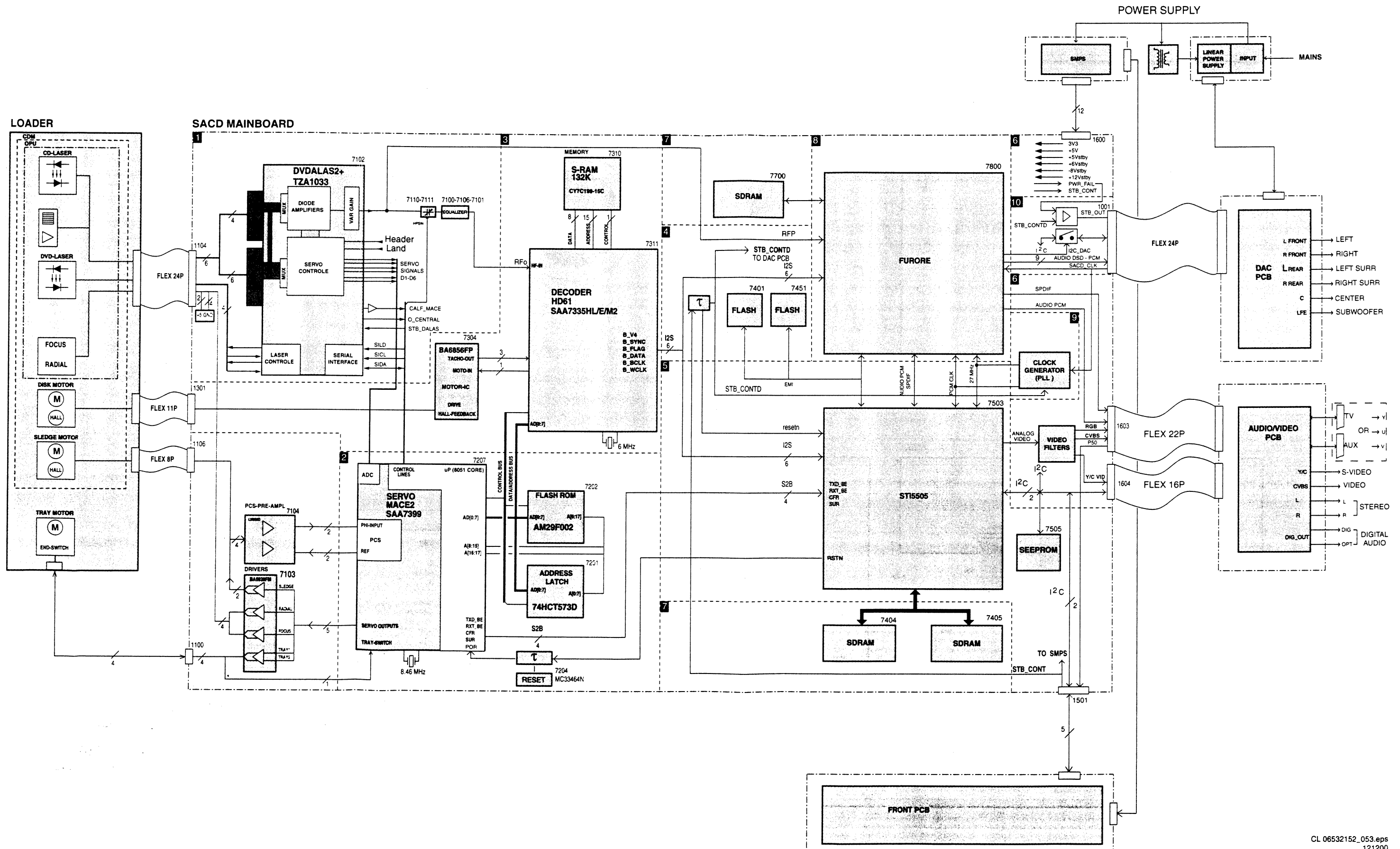
Wiring diagram

WIRING DIAGRAM



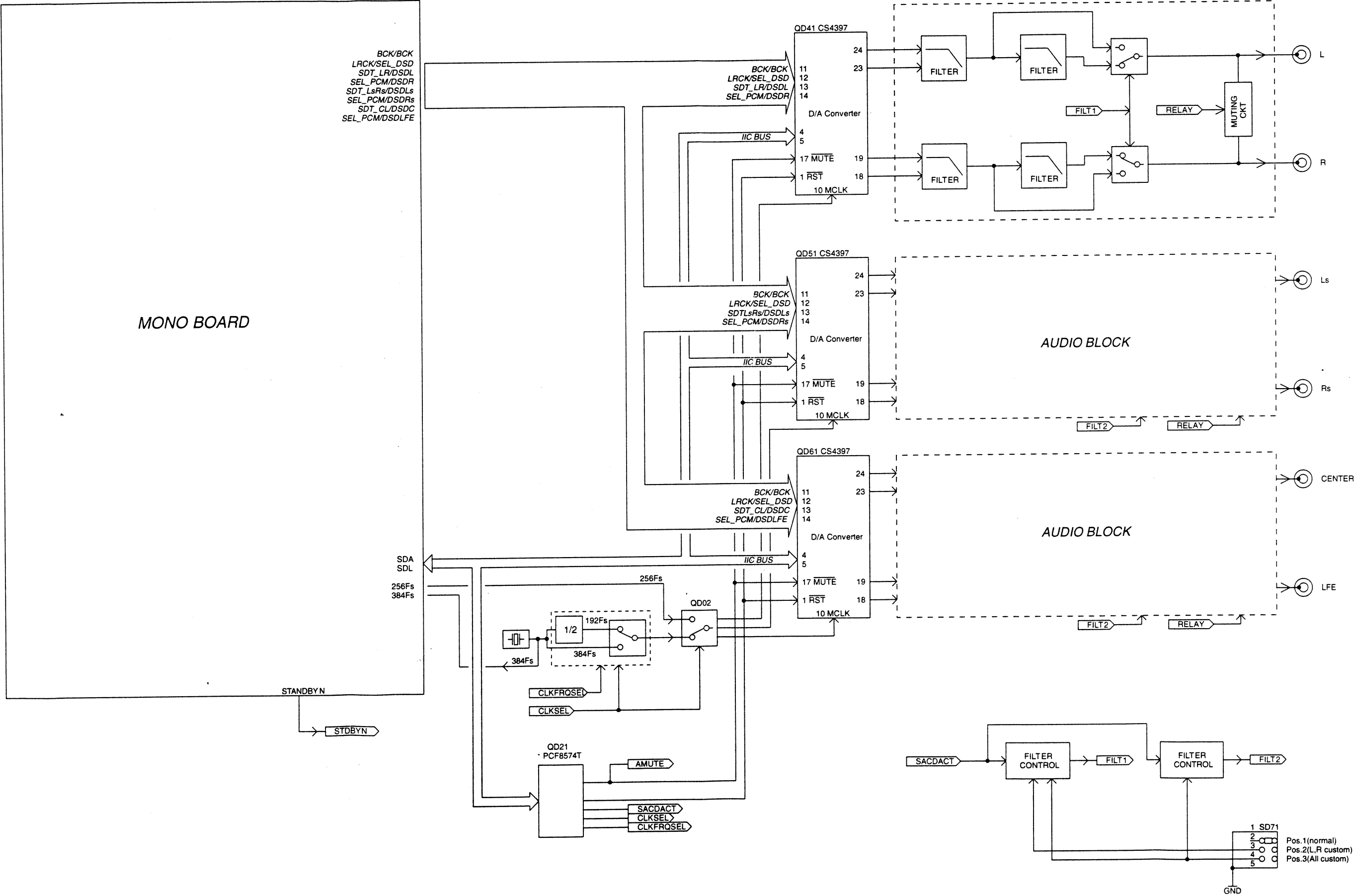
General block diagram

GENERAL BLOCK DIAGRAM



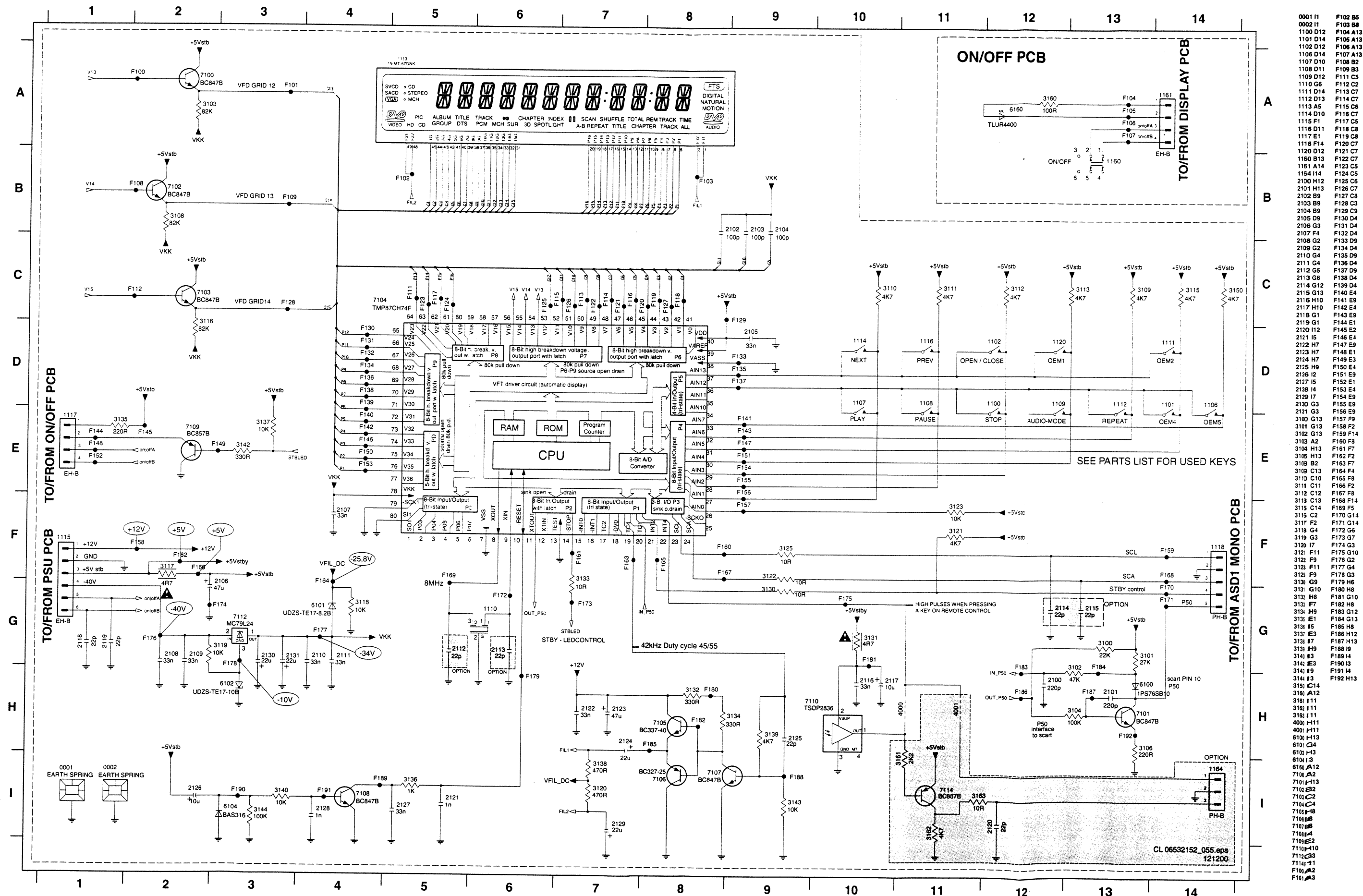
Block diagram DAC PCB

BLOCKDIAGRAM DAC PCB



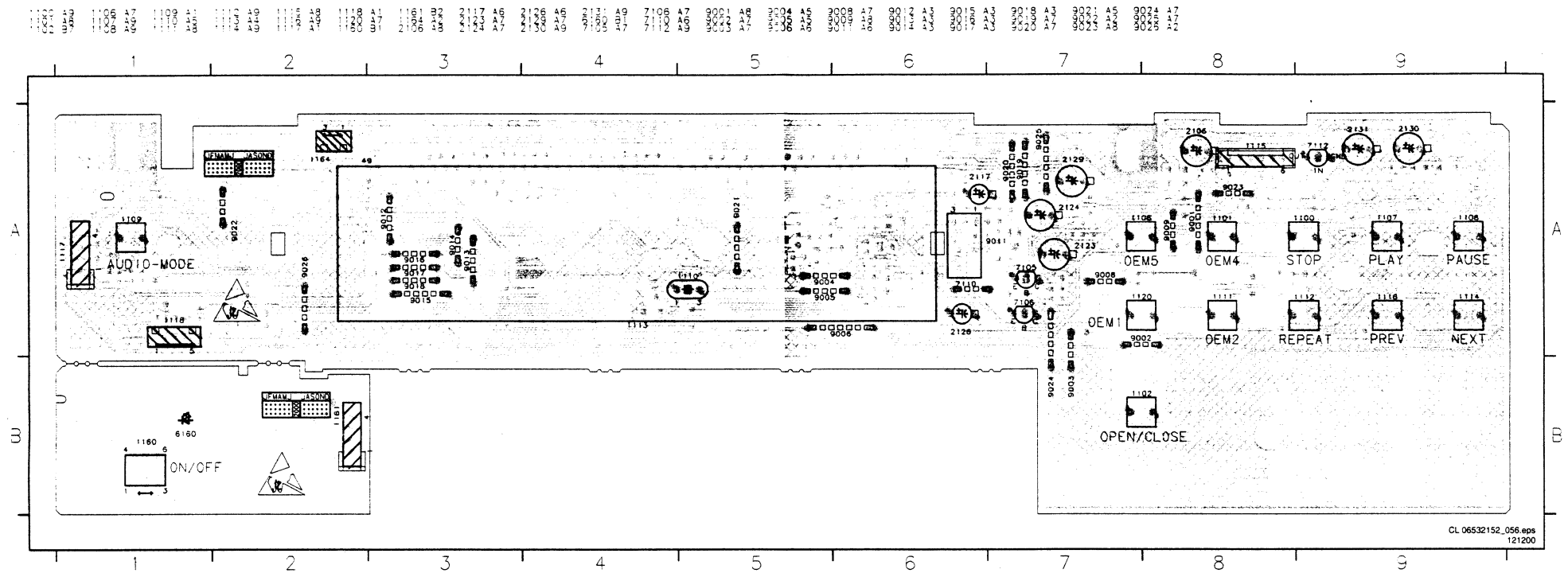
7. Electrical diagrams and PWB's

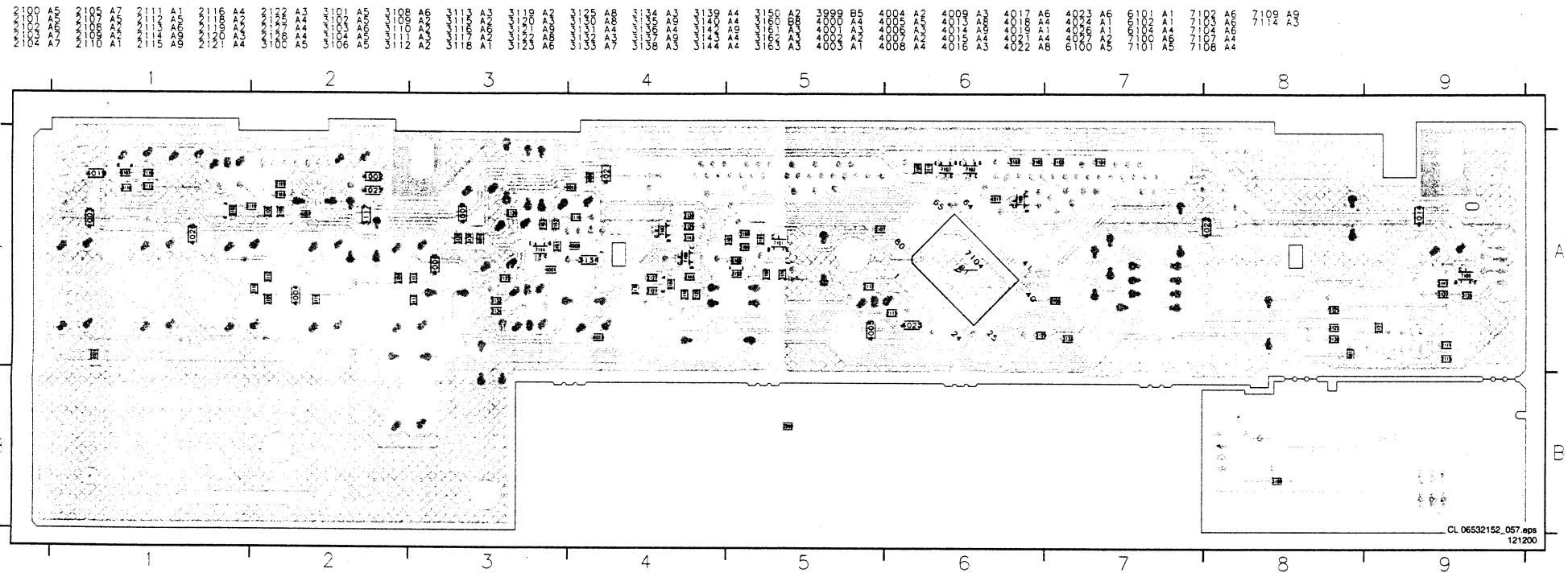
Display & on / off panel



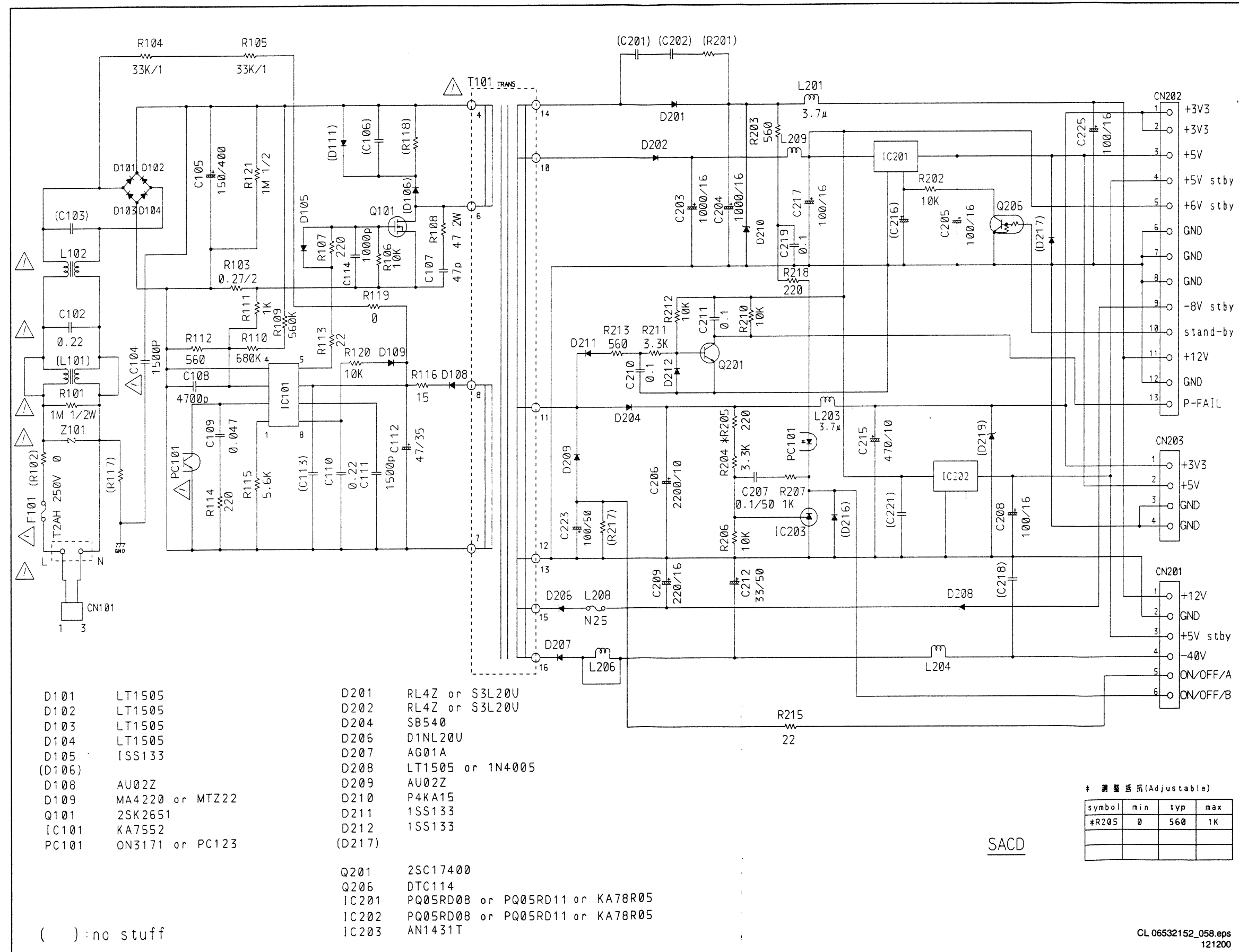
Layout Display & on / off panel (top view)

DISPLAY & ON/OFF PANEL TOP VIEW





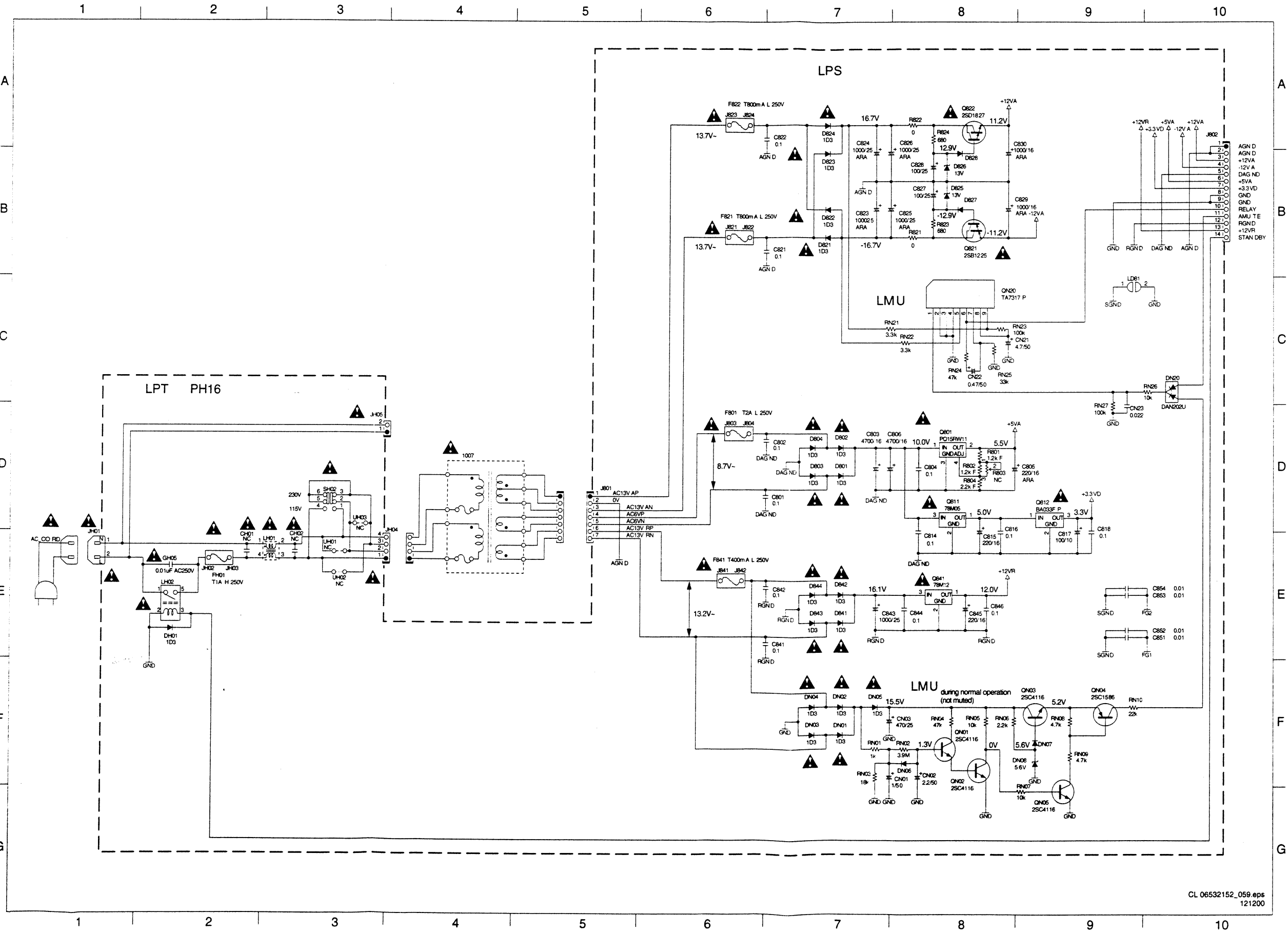
Switched mode power supply

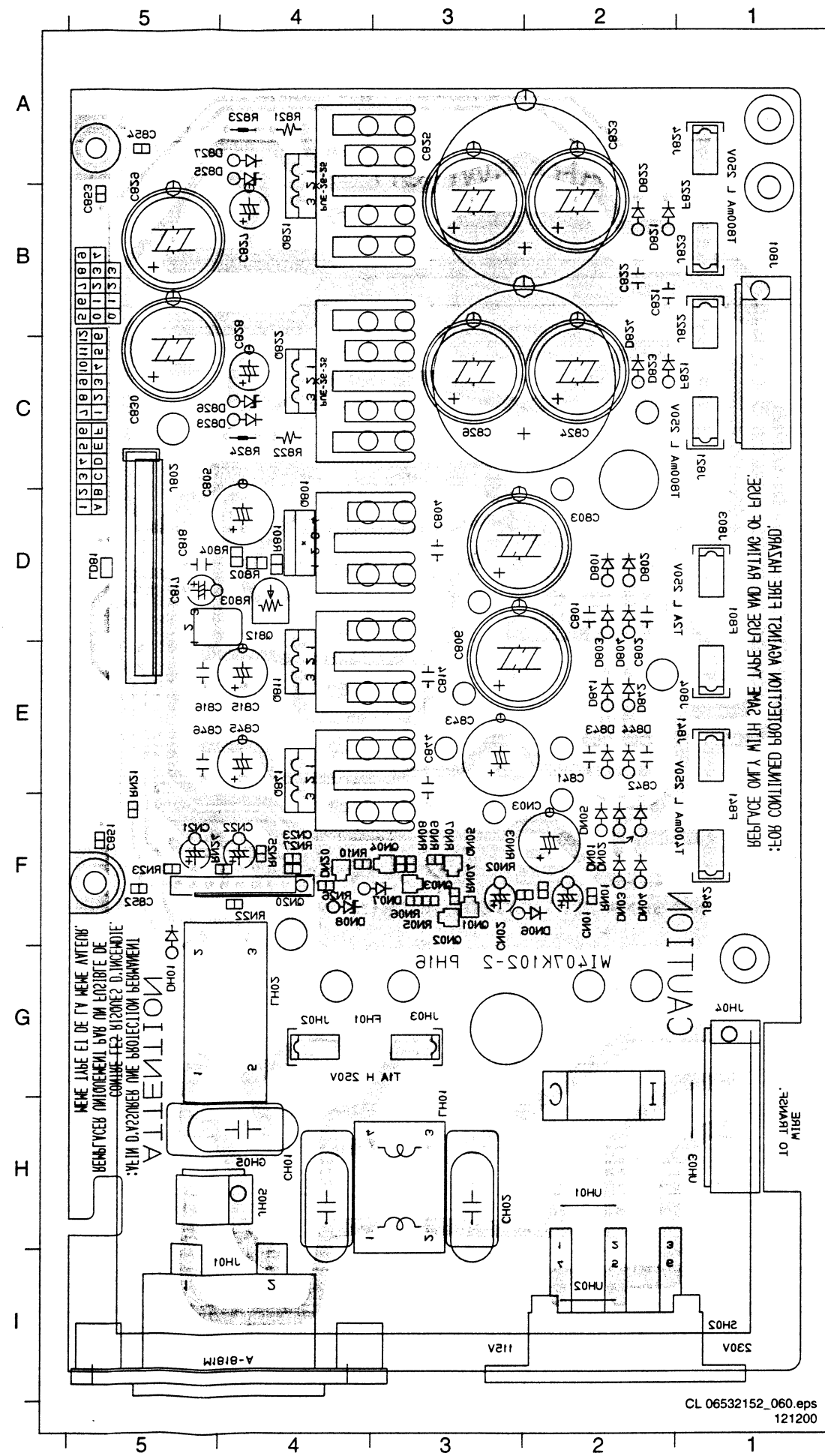
SWITCHED MODE POWER SUPPLY
FOR ORIENTATION ONLY

LPSU-L2-2N

LPSU-L2-2N

CH01 E2 CN21 C8 C803 D7 C815 D8 C822 A7 C827 B8 C842 E7 C851 E10 DN01 F7 DN06 F8 D802 D7 D823 B7 D826 B8 FH01 E2 GH05 E2 JH05 D4 J821 B6 J842 E6 QN02 F8 Q801 D8 Q841 E8 RN05 F8 RN10 F9 RN25 C8 R803 D8 R824 A8
CH02 E3 CN22 C8 C804 D8 C816 D8 C823 B7 C828 B8 C843 E7 C852 E10 DN02 F7 DN07 F9 D803 D7 D824 A7 D841 E7 F801 D6 JH01 E1 J801 D5 J822 B6 LD81 C9 QN03 F9 Q811 D8 Q841 E8 RN06 F8 RN21 C8 RN26 C10 R804 D8 SH02 D3
CN01 F8 CN23 D9 C805 D8 C817 D9 C824 B7 C829 B8 C844 E8 C853 E10 DN03 F7 DN08 F9 D804 D7 D825 B8 D842 E7 F821 B6 JH02 E2 J802 A10 J823 A6 LH01 E3 QN04 F9 Q812 D9 RN07 G9 RN22 C8 RN27 D9 R821 B8 UH01 E3
CN02 F8 C801 D7 C806 D7 C818 D9 C825 B8 C830 B8 C845 E8 C854 E10 DN04 F7 DN20 C10 D821 B7 D826 B8 D843 E7 F822 A6 JH03 E2 J803 D6 J824 A6 LH02 E2 QN05 G9 Q821 B8 RN08 F9 RN23 C8 R801 D8 R822 A8 UH02 E3
CN03 F8 C802 D7 C814 D8 C821 B7 C826 B8 C841 E7 C846 E8 DH01 E2 DN05 F7 DN01 D7 D822 B7 D827 B8 D844 E7 F841 E6 JH04 E4 J804 D6 J841 E6 QN01 F8 Q822 A8 RN09 F9 RN24 C8 R802 D8 R823 B8 UH03 D3



[illegible]

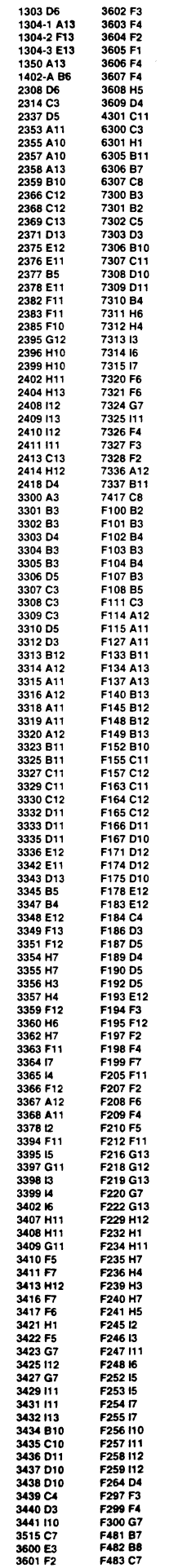
CN01	F2	RN01	F2
CN02	F3	RN02	F3
CN03	F2	RN03	F3
CN21	F5	RN04	F3
CN22	F4	RN05	F3
CN23	F4	RN06	F3
CH01	H4	RN07	F3
CH02	H3	RN08	F3
CH01	D2	RN09	F3
CH02	E2	RN10	F4
CH03	D2	RN21	F5
CH04	D3	RN22	F4
CH05	D5	RN23	F5
CH06	E3	RN24	F5
CH14	E3	RN25	F4
CH15	E4	RN26	F4
CH16	E5	RN27	F4
CH17	D5	R801	D4
CH18	D5	R802	D4
CH21	B2	R803	D4
CH22	B2	R804	D4
CH23	A2	R821	A4
CH24	C2	R822	C4
CH25	A3	R823	A4
CH26	C3	R824	C4
CH27	B4	SH02	H1
CH28	C4	UH01	H2
CH29	B5	UH02	H2
CH30	C5	UH03	H1
CH41	E2		
CH42	E2		
CH43	E3		
CH44	E3		
CH45	E4		
CH46	E5		
CH51	F5		
CH52	F5		
CH53	B5		
CH54	A5		
DN01	F2		
DN02	F2		
DN03	F2		
DN04	F2		
DN05	F2		
DN06	F3		
DN07	F3		
DN08	F4		
DN20	F4		
DH01	G5		
D801	D2		
D802	D2		
D803	E2		
D804	E2		
D821	B2		
D822	B2		
D823	C2		
D824	C2		
D825	A4		
D826	C4		
D827	A4		
D828	C4		
D841	E2		
D842	E2		
D843	E2		
D844	E2		
FH01	G3		
F801	D1		
F821	C1		
F822	B1		
F841	F1		
GH05	H4		
JH01	I4		
JH02	G4		
JH03	G3		
JH04	G1		
JH05	H4		
J801	B1		
J802	C5		
J803	D1		
J804	E1		
J821	C1		
J822	B2		
J823	B2		
J824	A1		
J841	E1		
J842	F1		
LH01	H3		
LH02	G4		
LD81	D5		
QN01	F3		
QN02	F3		
QN03	F3		
QN04	F3		
QN05	F3		
QN20	F4		
Q801	D4		
Q811	E4		
Q812	D4		
Q821	B4		
Q822	C4		
Q841	E4		

1300-1 A1	1301-14 G1	2360 D10	2373 G14	2389 C3	2401 E9	2419 B3	3350 C7	3414 E4	3612 H7	3621 F2	4304 F13	7316 C4	7999 H10	F118 C12	F129 C15	F142 D1	F158 E11	F173 F12	F196 C5	F215 D9	F230 E4	F260 A1	F270 A3	F279 F2
1300-2 C1	1301-15 E1	2361 D11	2374 G3	2390 D4	2403 E9	3321 D10	3352 B5	3415 E4	3613 H6	3622 F1	4305 F13	7322 F4	F105 A1	F119 C13	F130 D1	F143 D15	F159 E15	F178 G13	F200 C5	F217 C4	F231 E9	F261 E15	F271 B2	F280 F2
1300-3 C1	1301-16 E1	2362 D11		2379 C5	2391 D3	2405 F6	3322 D10	3353 C5	3416 H6	3614 H7	3623 F2	4307 A8	F106 C1	F120 H4	F131 C10	F144 G1	F160 E11	F177 G14	F201 C5	F221 D4	F237 E6	F262 E2	F272 B2	F281 G1
1300-5 C1	1301-2 D1	2363 E15		2380 C6	2392 D9	2406 F7	3331 B8	3400 D3	3419 F6	3615 A3	3624 F1	4308 A8	F109 C1	F121 H5	F132 C15	F146 C15	F161 E15	F180 G14	F202 C6	F223 D4	F233 E6	F263 E11	F273 B2	F298 C14
1300-6 G1	1301-8 D1	2364 E15		2381 C7	2393 D4	2407 F8	3334 C8	3401 D3	3420 H8	3616 B2	3625 G1	4309 A8	F110 C1	F122 H1	F133 C12	F147 G1	F162 H7	F181 G13	F203 C6	F224 D4	F234 E6	F264 E11	F274 B2	F301 B1
1300-8 A1	1301-9 E1	2365 E15		2384 C3	2394 D9	2412 H4	3338 B1	3402 D3	3430 H4	3617 B2	3626 F2	4310 A8	F111 C1	F123 C14	F134 C15	F148 C15	F168 F13	F182 G3	F204 C7	F225 D4	F235 E6	F265 E11	F275 E2	
1300-9 A1	1301-10 E1	2366 F12		2385 D9	2395 D4	2413 H4	3339 D4	3403 D3	3431 H4	3618 B2	3627 E2	4311 A8	F112 C1	F124 C14	F135 D1	F149 C15	F169 F13	F183 A10	F205 C7	F226 D9	F236 E6	F266 E11	F276 E2	
1301-10 D1		2352 C13		2387 C3	2398 D3	2416 E11		3340 H4	3405 D3	3619 B2	3628 F2	7304 H3	F116 C13	F125 C14	F139 D11	F154 C15	F170 F12	F188 A10	F213 C9	F227 D4	F244 F4	F258 H6	F277 F2	
1301-13 D1		2354 H3		2372 G13	2388 D9	2400 E4	2417 D15	3341 H4	3406 E3	3619 B2	3629 E3	7305 C11	F117 C12	F128 D1	F141 D11	F156 C15	F172 F12	F191 A10	F214 C4	F228 D4	F249 F4	F269 A2	F278 F1	

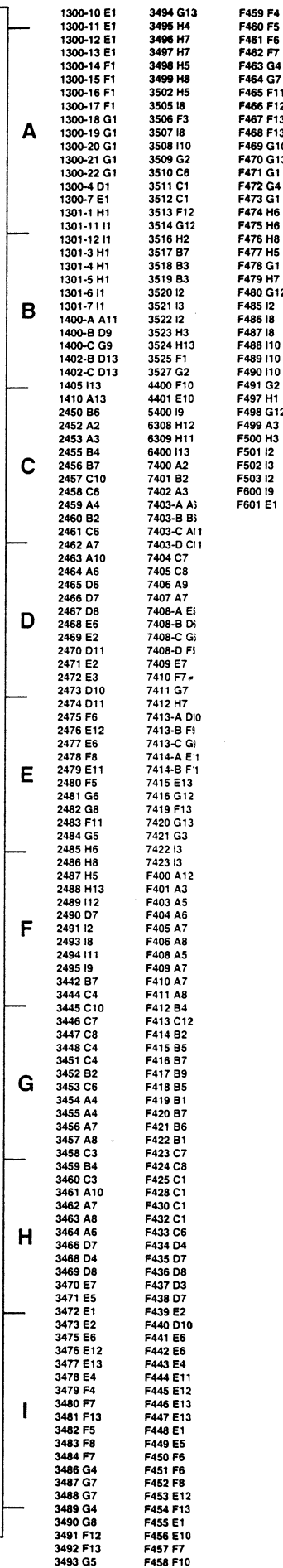
The schematic diagram illustrates the internal circuitry of a television set, organized into several functional sections:

- Power Supply Section:** Located at the top left, it shows the conversion of AC input (1300-1 to 1300-9) through a transformer (F105) and various diodes (F269, F271, F272, F273) to provide regulated DC voltages: -9.2V, -8Vstby, -8.6V, -0.16V, and 0V. It also includes a section for +12Vstby and +10.8V derived from a 11.2V source.
- Video Processing Section:** The central part of the diagram features a large block labeled 'TDA4780' (7316), which handles video signals. It includes sub-blocks for 'SOURCE SWITCH', 'Y-MATRIX', 'ADAPTIVE BLACK', 'GAMMA', 'PEAK BEAM LIMITING', 'PEAK DRIVE LIMITING', 'SATURATION ADJUST', 'CONTRAST ADJUST', 'BRIGHTNESS ADJUST', and 'LEAKAGE AND CUT-OFF CONTROL'. It also shows 'I2C' and 'SYNC INPUT' connections.
- Audio Processing Section:** At the bottom, it details the audio path, including a 7304 LF80C audio amplifier, a 7329 BC847B pre-amplifier, and a 7330 BC847B output stage. It shows the conversion of +12Vstby to +8V Aud and +8Vstby, and the processing of stereo signals (STEREO_R, STEREO_L) through various filters and components.
- Control and Tuning Section:** On the right side, it shows the control logic, including a 7305 STV6410A tuner, various control lines (Y_OUT, L_OUT, C_OUT, R_OUT, Y_IN, L_IN, C_IN, R_IN), and a section for 'ELECTRONIC VOLT METER' and 'DC VOLTAGES MEASURED IN STOP MODE'.
- Component Values and Test Points:** The diagram is densely packed with component values (resistors, capacitors, inductors) and test points (F101 to F273, F101 to F191, F101 to F191, F101 to F191). It also includes a 'PROCESS CHIPS' section with a 7988 BC847B component.

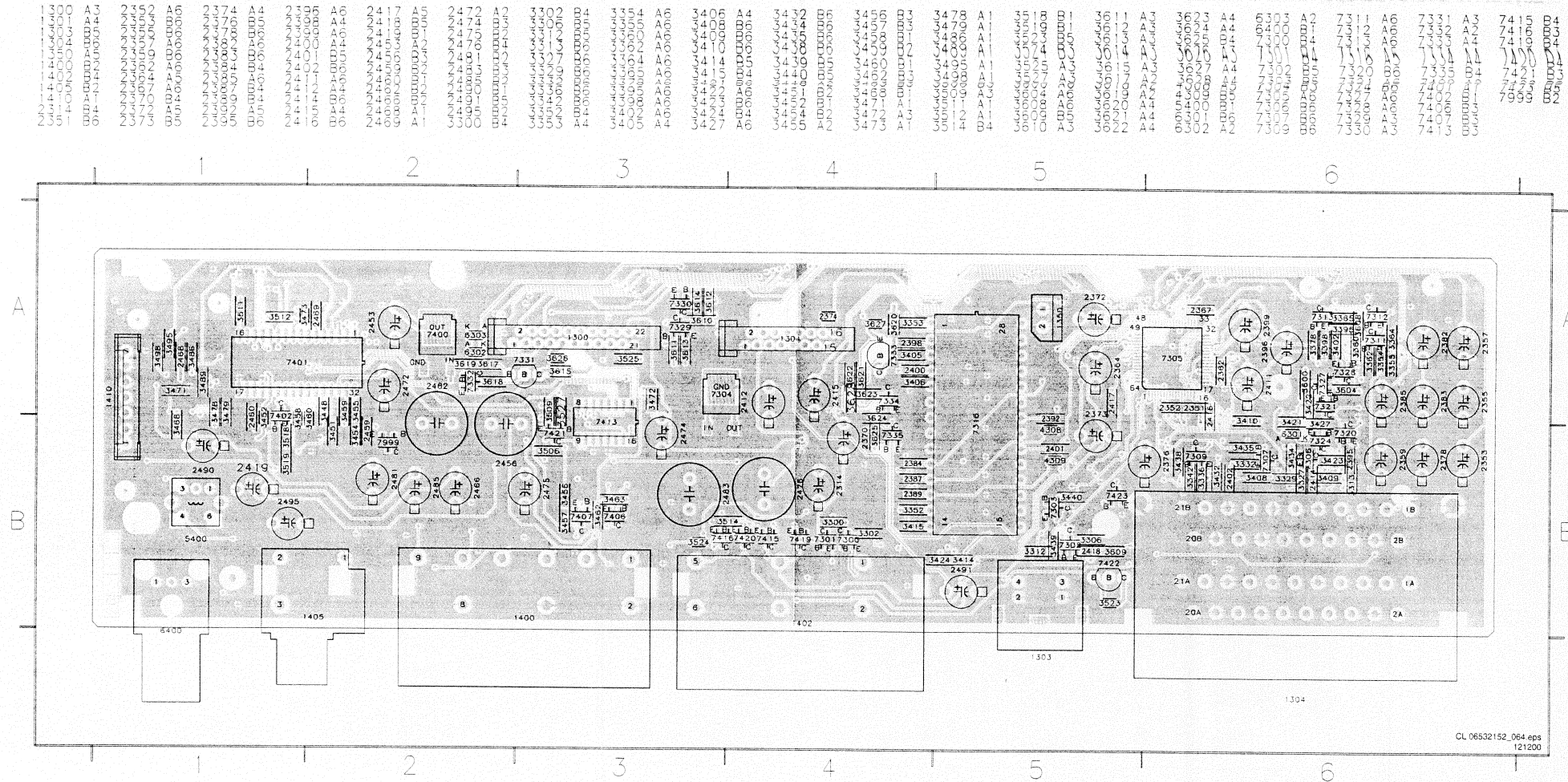
1 B VIDEO OUT



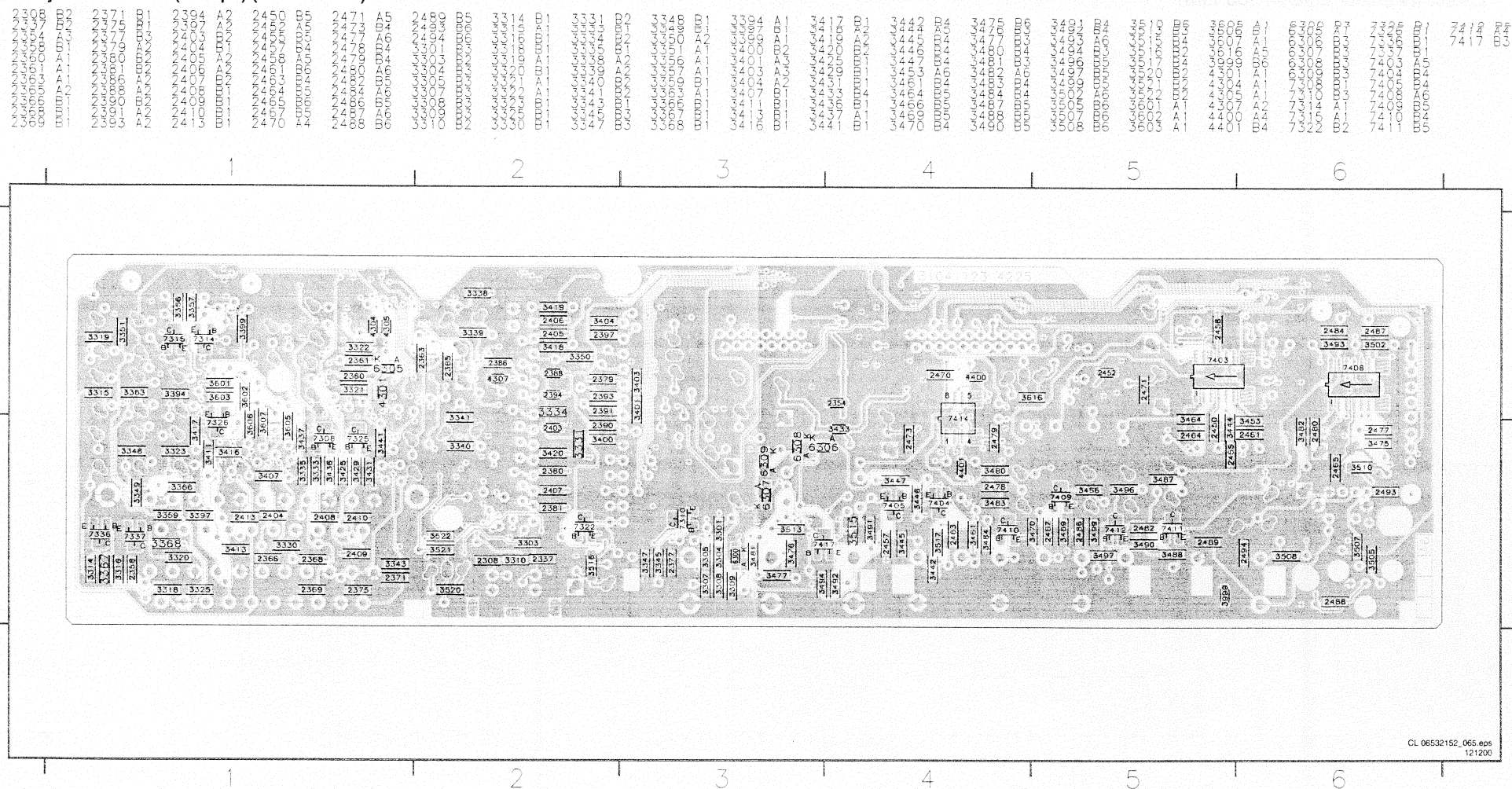
2 AUDIO



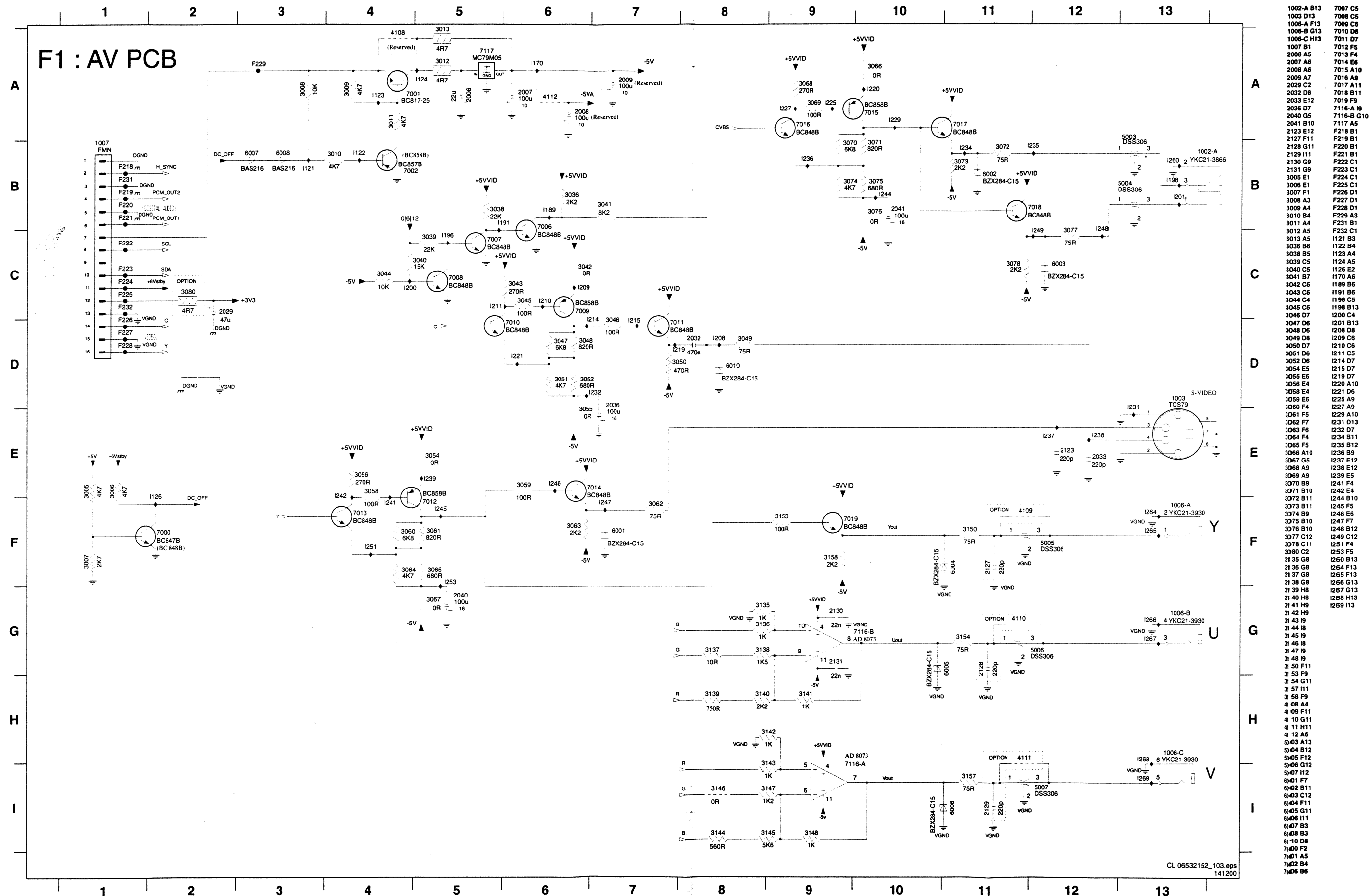
Layout AV Board (Europe) (top view)



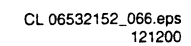
Layout AV Board (Europe) (bottom view)



AV Board (US + AP): Video

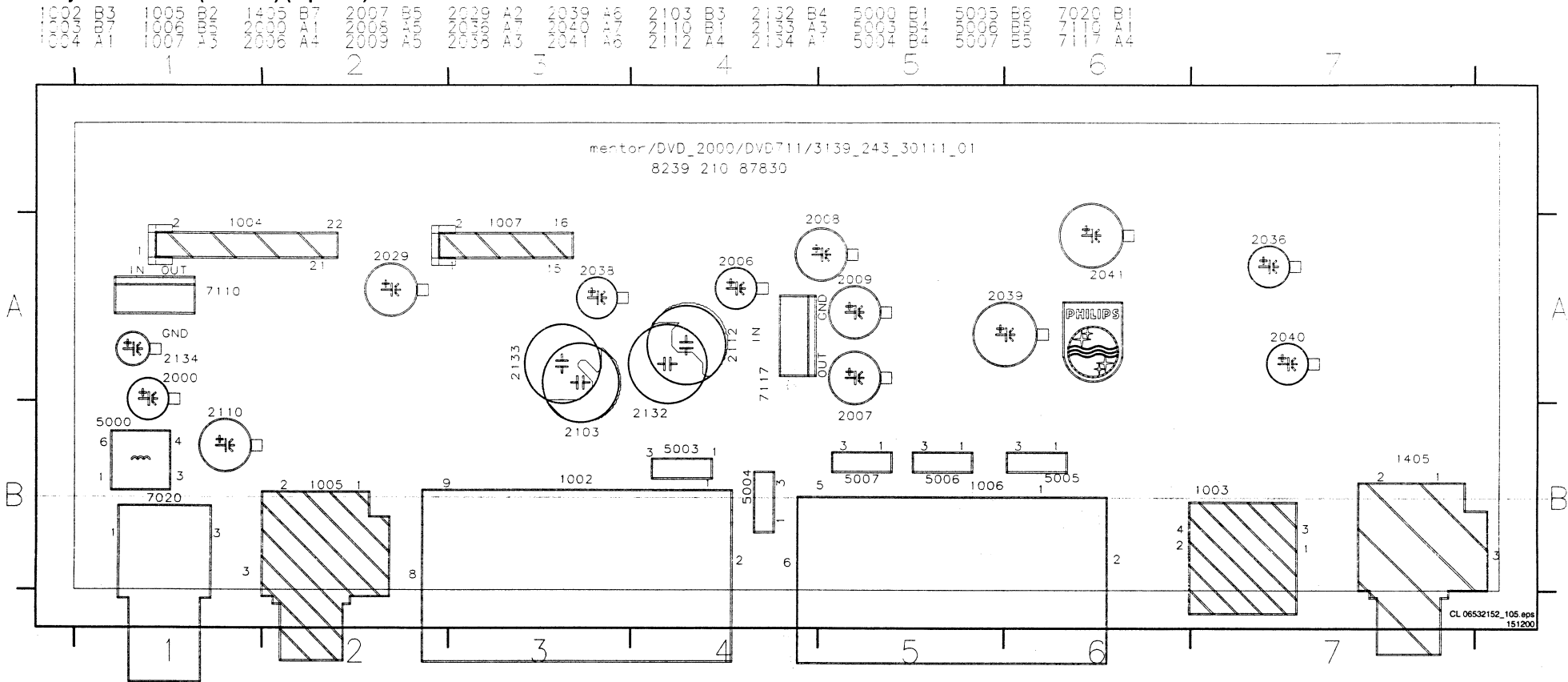


F2 : AV PCB

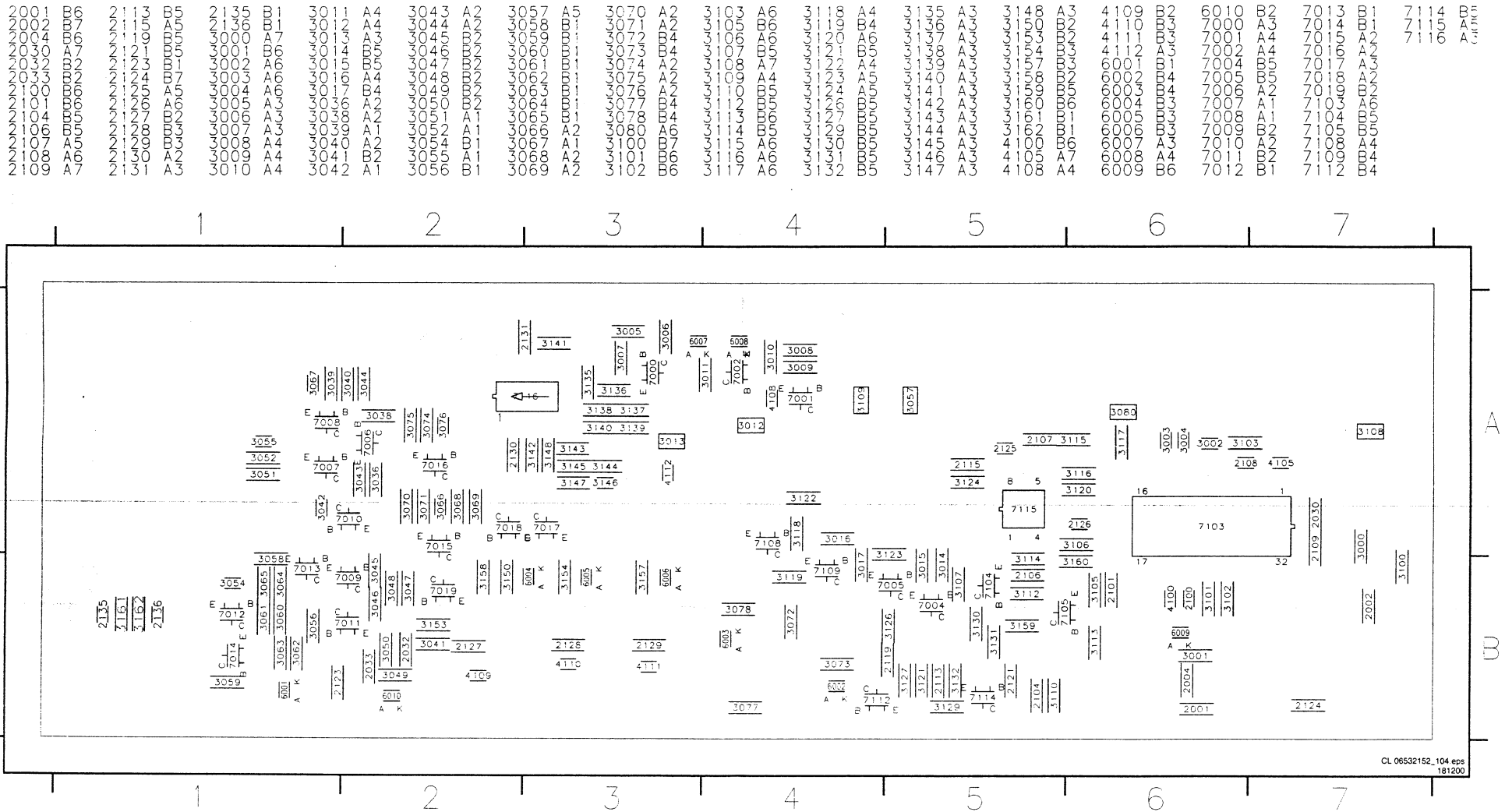


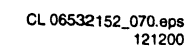
1002-B G13	F210 D1
1002-C E13	F211 E1
1004 C1	F212 E1
1005 B12	F213 E1
1405 A12	F214 E1
2000 B7	F215 F1
2001 B11	F216 F1
2002 B7	F230 E1
2004 B11	F233 E1
2030 F2	
2038 D2	I102 B8
2039 E2	I103 B8
2100 B4	I105 B3
2101 D6	I106 B10
2103 D9	I108 C3
2104 E11	I109 B10
2106 E8	I110 B8
2107 F6	I112 C3
2108 E4	I115 A6
2109 E5	I120 C11
2110 E5	I127 E10
2110 E9	I128 B4
2115 G11	I140 C5
2115 G8	I141 H6
2119 H11	I142 H10
2121 E1	I143 E9
2124 C12	I145 D7
2125 D8	I153 D8
2126 E8	I154 D9
2132 F8	I155 D10
2133 F8	I156 D11
2134 F2	I157 D7
2135 A11	I159 D10
2136 A12	I161 E12
3000 B7	I162 G12
3001 B9	I163 D5
3002 B3	I165 D5
3003 C3	I166 E5
3004 C3	I167 E4
3014 E9	I171 E9
3015 F9	I172 E4
3016 G9	I174 F5
3017 H9	I175 F7
3057 D2	I176 G8
3100 C10	I177 G9
3101 B6	I178 G9
3102 B6	I179 G10
3103 B3	I180 F11
3105 D6	I181 G5
3106 D6	I182 G7
3107 D9	I183 G10
3108 F2	I185 G12
3109 D2	I207 H11
3110 E11	I217 E12
3112 E9	I223 E11
3113 E10	I261 G12
3114 E8	I262 E12
3115 F6	I263 E12
3116 F6	I270 A12
3117 D3	I271 A12
3118 G9	
3119 G10	
3120 G6	
3121 G11	
3122 G9	
3123 G10	
3124 G8	
3126 G10	
3127 H11	
3129 H11	
3130 E10	
3131 E10	
3132 F11	
3159 D10	
3160 E6	
3161 A10	
3162 A10	
4100 B4	
4105 E4	
5000 B8	
6009 A5	
7004 F9	
7005 H10	
7020 C12	
7103 B4	
7104 E9	
7105 E10	
7108 G9	
7109 G10	
7110 F2	
7112 H12	
7114 F12	
7115-A D8	
7115-B F8	
F200 C1	
F201 C1	
F202 C1	
F203 C1	
F204 D1	
F205 D1	
F206 D1	
F207 C1	
F208 D1	
F209 D1	

Layout AV Board (US + AP) (top view)



Layout AV Board (US + AP) (bottom view)



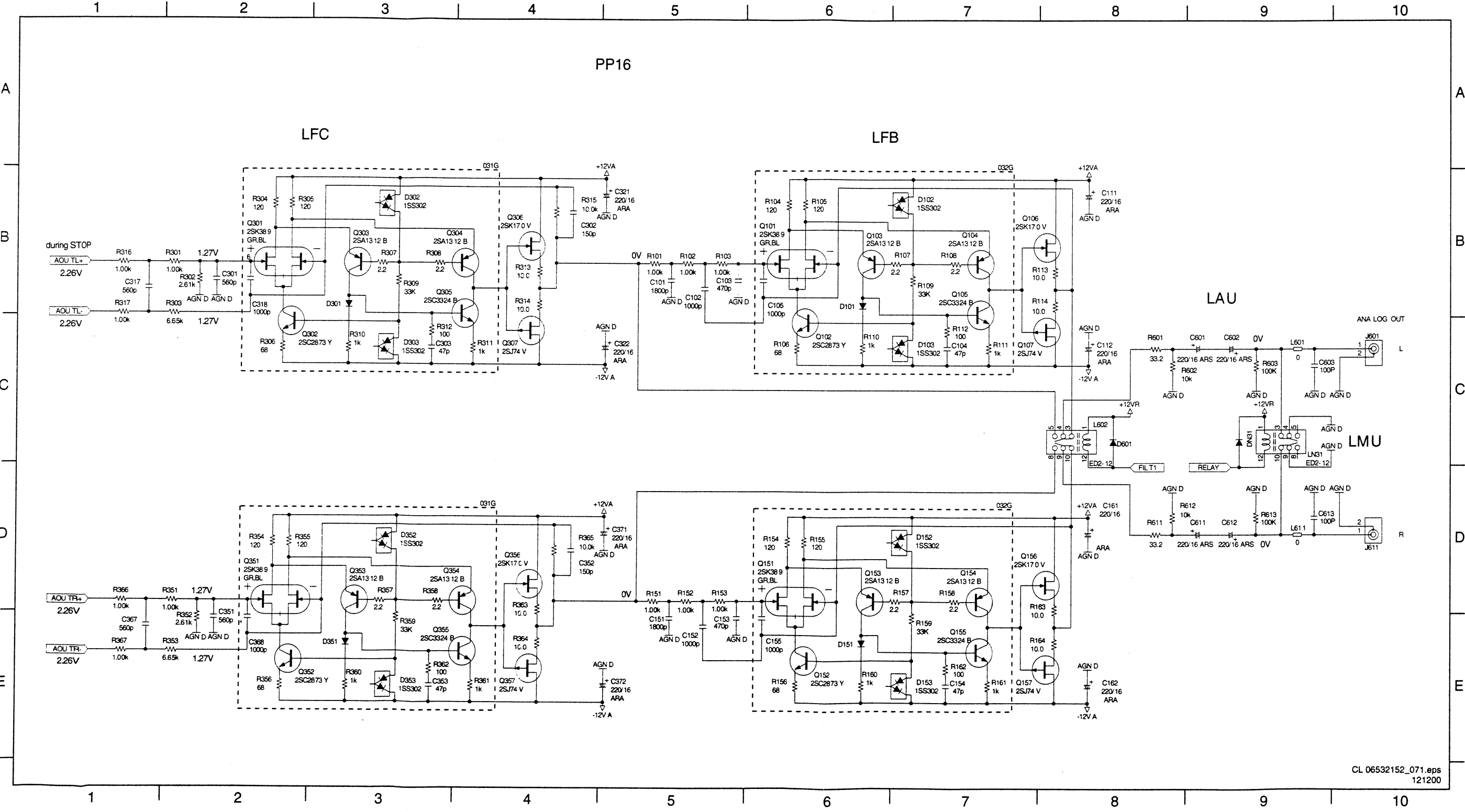
DAC-L2N

C001	C2	R033	E4
C002	C2	R034	E4
C003	D2	R041	A5
C004	D2	R042	A5
C005	E2	R043	B6
C006	D4	R044	A6
C007	C3	R045	A6
C008	D2	R046	B6
C009	D2	R051	C5
C011	C2	R052	C5
C012	C2	R053	D6
C017	C2	R054	C6
C018	C2	R055	C6
C021	F3	R056	D6
C023	A2	R061	D5
C024	A3	R062	E5
C040	A6	R063	E6
C041	A6	R064	E6
C042	A6	R065	E6
C043	A6	R066	E6
C044	A6	R071	F5
C045	A6	R072	F5
C046	A6	R073	G5
C047	A6	R074	G5
C048	A6	R075	F6
C049	A6	R076	F6
C050	C6	R077	F6
C051	C6	R078	F6
C052	C6	R079	G7
C053	C6	R080	F6
C054	C6	R081	F7
C055	C6	R082	F7
C056	C6	R083	F8
C057	C6	R084	F8
C058	C6	R085	F8
C059	C6	R086	F8
C060	D6	R087	F9
C061	D6	R088	F9
C062	D6	R089	F9
C063	D6	R090	F9
C064	D6	SD71	G7
C065	D6	XD01	D2
C066	D6	031L	E9
C067	D6		
C068	D6		
C069	D6		
C071	G6		
C072	G6		
C091	D9		
C092	D9		
C093	D9		
C094	D9		
C095	D9		
C096	D9		
DD21	B2		
DD23	A2		
JD01	C1		
JD02	A1		
LD01	C2		
LD02	D4		
LD41	A5		
LD51	B5		
LD61	D5		
QD01A	D2		
QD01B	D2		
QD01C	D2		
QD02A	E2		
QD02B	D3		
QD02C	D3		
QD02E	E3		
QD03A	C4		
QD03B	C4		
QD03C	D4		
QD03D	D4		
QD04	E3		
QD05	D3		
QD06A	D2		
QD06B	E2		
QD06C	D2		
QD21	F3		
QD22	C1		
QD23	A2		
QD32	E4		
QD41	B6		
QD51	C6		
QD61	E6		
QD71	F5		
QD72	G6		
QD73	F6		
QD74	F7		
QD75	F8		
QD76	F8		
QD77	F9		
QD78	F9		
RD01	D2		
RD02	D2		
RD03	D4		
RD04	C4		
RD05	D4		
RD06	D4		
RD07	E3		
RD08	E3		
RD09	D2		
RD11	C2		
RD12	C2		
RD13	C2		
RD14	C2		
RD15	C2		
RD16	C2		
RD17	C2		
RD18	B2		
RD21	F2		
RD22	F2		
RD26	F2		
RD27	F2		
RD28	F2		
RD29	B1		
RD30	B1		

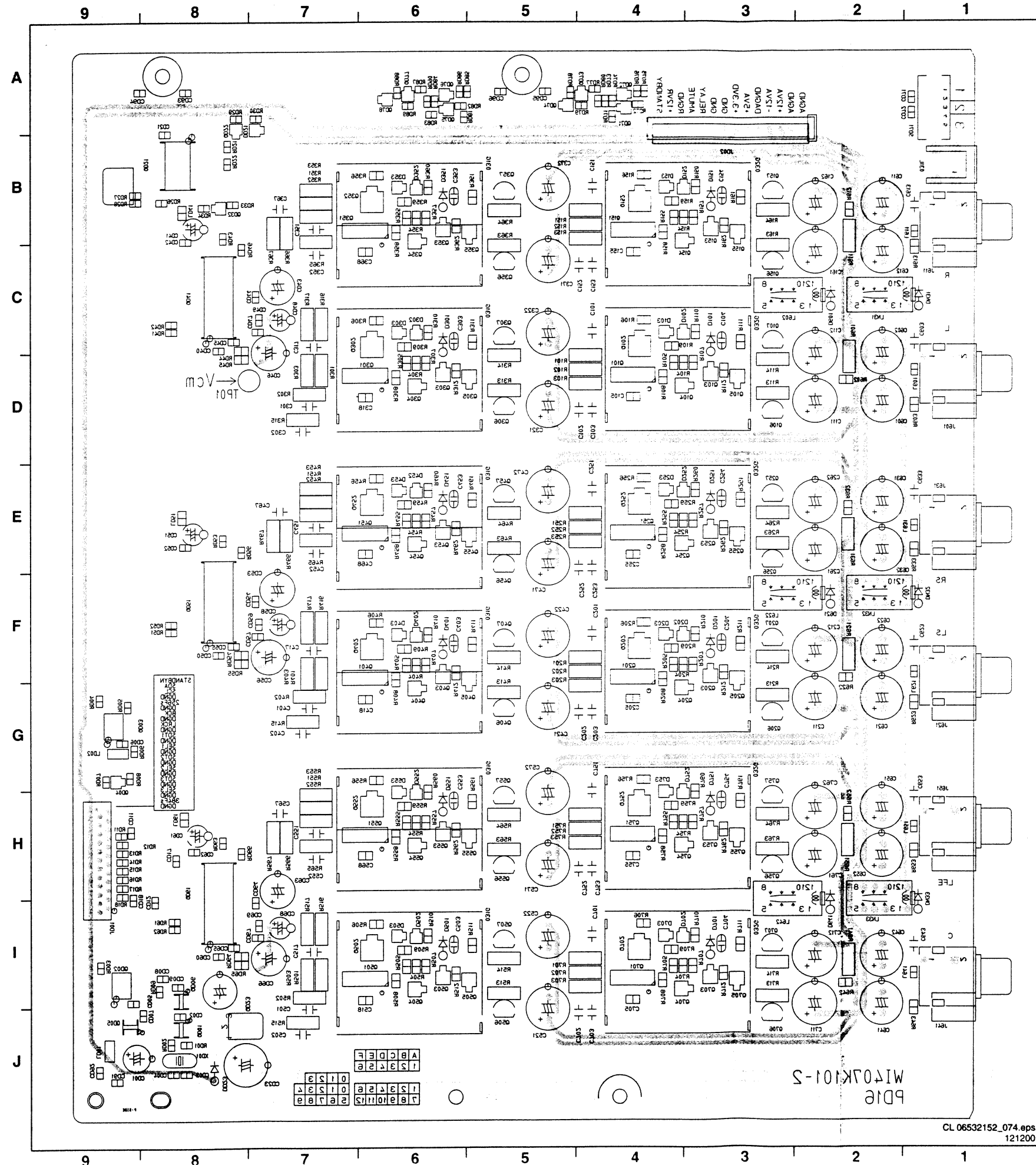
Audio1-L2N

AUDIO1-L2N

C101 B5	C161 D8	C367 E1	D102 B7	J601 C10	Q107 B8	Q305 B4	R103 B5	R151 D5	R163 D8	R311 C4	R356 E2	R601 C8
C102 B5	C162 E8	C368 E2	D103 C7	J611 D10	Q151 D6	Q306 B4	R104 B6	R152 D5	R164 E8	R312 C3	R357 D3	R602 C8
C103 B5	C301 B2	C371 D5	D151 E6	LN31 C9	Q152 E6	Q307 C4	R105 B6	R153 D5	R301 B2	R313 B4	R358 D3	R603 C9
C104 C7	C302 B4	C372 E5	D152 D7	L601 C9	Q153 D6	Q351 D2	R106 C6	R154 D6	R302 B2	R314 B4	R359 E3	R611 D8
C105 B6	C303 C3	C601 C9	D153 E7	L602 C8	Q154 D7	Q352 E2	R107 B7	R155 D6	R303 B2	R315 B4	R360 E3	R612 D8
C111 B8	C317 B1	C602 C9	D301 B3	L611 D9	Q155 E7	Q353 D3	R108 B7	R156 E6	R304 B2	R316 B1	R361 E4	R613 D9
C112 C8	C318 B2	C603 C9	D302 B3	Q101 B6	Q156 D8	Q354 D4	R109 B7	R157 D7	R305 B2	R317 B1	R362 E3	
C151 E5	C321 B5	C611 D9	D303 C3	Q102 C6	Q157 E8	Q355 E4	R110 C6	R158 D7	R306 C2	R351 D2	R363 D4	
C152 E5	C322 C5	C612 D9	D351 E3	Q103 B6	Q301 B2	Q356 D4	R111 C7	R159 E7	R307 B3	R352 E2	R364 E4	
C153 E5	C351 E2	C613 D9	D352 D3	Q104 B7	Q302 C2	Q357 E4	R112 C7	R160 E6	R308 B3	R353 E2	R365 D4	
C154 E7	C352 D4	DN31 C9	D353 E3	Q105 B7	Q303 B3	R101 B5	R113 B8	R161 E7	R309 B3	R354 D2	R366 D1	
C155 E6	C353 E3	D101 B6	D601 C8	Q106 B8	Q304 B4	R102 B5	R114 B8	R162 E7	R310 C3	R355 D2	R367 E1	

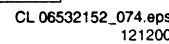


Layout DAC board (Bottom view)



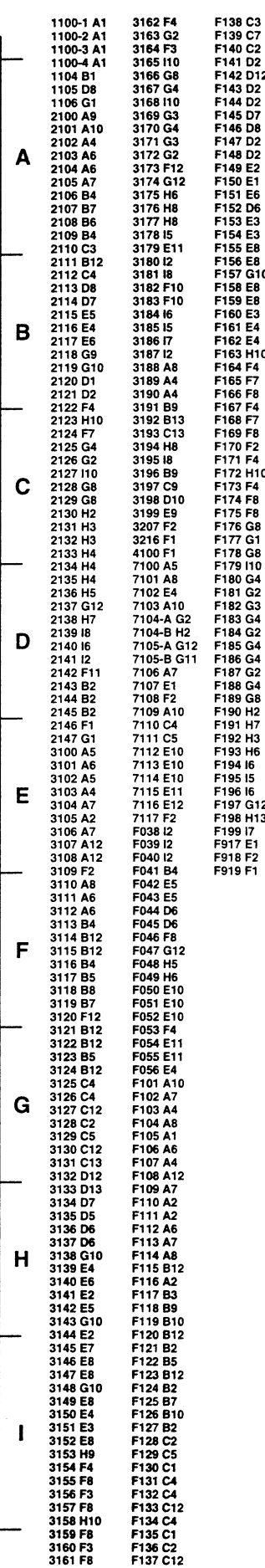
CD01 J9	C801 D2	Q103 D4	RD65 I8	R413 F5
CD02 J8	C802 C2	Q104 D4	RD66 H8	R414 F5
CD03 J8	C803 C2	Q105 D3	RD67 A4	R415 G7
CD04 J9	C811 B2	Q106 D3	RD72 A4	R416 F7
CD05 I9	C812 C2	Q107 C3	RD73 A4	R417 F7
CD06 G9	C813 B2	Q151 B4	RD74 A4	R451 E7
CD07 J9	C821 G2	Q152 B4	RD75 A4	R452 E7
CD08 I9	C822 F2	Q153 B3	RD76 A4	R453 E7
CD09 I8	C823 F2	Q154 B4	RD77 A5	R454 E6
CD11 I9	C631 E2	Q155 B3	RD78 A5	R455 E6
CD12 I9	C632 E2	Q156 C3	RD79 A5	R456 E7
CD17 H8	C633 E2	Q157 B3	RD80 A5	R457 E6
CD18 I9	C641 J2	Q201 F4	RD81 A6	R458 E6
CD21 A9	C642 I2	Q202 F4	RD82 A6	R459 E6
CD23 J8	C643 I2	Q203 F4	RD83 A6	R460 E6
CD24 I8	C651 H2	Q204 F4	RD84 A6	R461 E6
CD40 C8	C852 H2	Q205 G3	RD85 A6	R462 E6
CD41 B8	C853 H2	Q206 G3	RD86 A6	R463 E5
CD42 B8	C701 I5	Q207 F3	RD87 A6	R464 E5
CD43 C7	C702 J5	Q251 E4	RD88 A6	R465 E7
CD44 C8	C703 J5	Q252 E4	RD89 A6	R466 E7
CD45 C8	C704 I3	Q253 E4	RD90 A6	R467 E8
CD46 D8	C705 I4	Q254 E4	R101 D5	R501 I7
CD47 C8	C711 J3	Q255 E3	R102 D5	R502 I7
CD48 C7	C712 I3	Q256 E3	R103 D5	R503 I7
CD49 C8	C751 G5	Q257 E3	R104 D4	R504 I6
CD50 F8	C752 H5	Q301 D7	R105 D4	R505 I6
CD51 E8	C753 H5	Q302 C7	R106 C4	R506 I7
CD52 E8	C754 G3	Q303 D6	R107 D4	R507 I6
CD53 F8	C755 H4	Q304 D6	R108 D4	R508 I6
CD54 F8	C761 H2	Q305 D6	R109 C4	R509 I6
CD55 F8	C762 G2	Q306 D5	R110 C4	R510 I6
CD56 F8	DD21 A8	Q307 C5	R111 C3	R511 I6
CD57 F8	DD23 J8	Q351 B7	R112 D3	R512 I6
CD58 F8	DN31 C2	Q352 B7	R113 D3	R513 I5
CD59 F8	DN32 F2	Q353 B6	R114 D3	R514 I5
CD60 I8	DN33 H2	Q354 B6	R151 B5	R515 J7
CD61 H8	D101 C4	Q355 B6	R152 B5	R516 I7
CD62 H8	D102 C4	Q356 C5	R153 B5	R517 I7
CD63 H7	D103 C4	Q357 B5	R154 B4	R551 H7
CD64 H8	D151 B4	Q401 F7	R155 B4	R552 H7
CD65 I8	D152 B4	Q402 F7	R156 B4	R553 H7
CD66 I8	D153 B4	Q403 G6	R157 B4	R554 H6
CD67 I8	D201 F3	Q404 G6	R158 B4	R555 H6
CD68 I7	D202 F4	Q405 G6	R159 B4	R556 G7
CD69 I8	D203 F4	Q406 G5	R160 B4	R557 H6
CD71 A2	D251 E4	Q407 F5	R161 B3	R558 H6
CD72 A2	D252 E4	Q451 E7	R162 B3	R559 H6
CD91 J9	D253 E4	Q452 E7	R163 B3	R560 G6
CD92 J9	D301 C6	Q453 E6	R164 B3	R561 H6
CD93 A8	D302 C6	Q454 E6	R201 F5	R562 H6
CD94 A9	D303 C6	Q455 E6	R202 F5	R563 H5
CD95 A5	D351 B6	Q456 F5	R203 F5	R564 H5
CD96 A5	D352 B6	Q457 E5	R204 F4	R565 H7
C101 C5	D353 B6	Q501 I7	R205 F4	R566 H7
C102 D5	D401 F6	Q502 I7	R206 F4	R567 H8
C103 D5	D402 F6	Q503 I6	R207 F4	R601 C2
C104 C3	D403 F6	Q504 I6	R208 F4	R602 D2
C105 D4	D451 E6	Q505 I6	R209 F4	R603 D2
C111 D2	D452 E6	Q506 J5	R210 F4	R611 C2
C112 C2	D453 E6	Q507 I5	R211 F3	R612 B2
C151 B5	D501 I6	Q551 H7	R212 F3	R613 C2
C152 C5	D502 I6	Q552 H7	R213 F3	R621 F2
C153 C5	D503 I6	Q553 H6	R214 F3	R622 F2
C154 B3	D551 G6	Q554 H6	R251 E5	R623 G2
C155 B3	D552 G6	Q555 H6	R252 E5	R631 E2
C161 C2	D553 G6	Q556 H5	R253 E5	R632 E2
C162 B2	D601 C2	Q557 G5	R254 E4	R633 E2
C201 F5	D621 F2	Q701 I4	R255 E4	R641 I2
C202 G5	D641 I2	Q702 I4	R256 E4	R642 I2
C203 G5	D701 I4	Q703 I4	R257 E4	R643 J2
C204 F3	D702 I4	Q704 I4	R258 E4	R651 H2
C205 G4	D703 I4	Q705 I3	R259 E4	R652 H2
C211 G3	D751 G4	Q706 J3	R260 E4	R653 H2
C212 F2	D752 G4	Q707 I3	R261 E3	R701 I5
C251 E5	D753 G4	Q751 H4	R262 E3	R702 I5
C252 F5	JD01 I9	Q752 H4	R263 E3	R703 I5
C253 F5	JD02 A3	Q753 H4	R264 E3	R704 I4
C254 E3	J601 D1	Q754 H4	R301 D7	R705 I4
C255 E4	J611 C2	Q755 H3	R302 D7	R706 I4
C256 I2	J621 G2	Q756 H3	R303 D7	R707 I4
C262 E2	J631 E1	Q757 H3	R304 D6	R708 I4
C301 D7	J641 J1	RD01 J8	R305 D6	R709 I4
C302 D7	J651 H1	RD02 J9	R306 C7	R710 I4
C303 C6	LD01 J9	RD03 I9	R307 D6	R711 I3
C317 C7	LD02 G9	RD04 G9	R308 D6	R712 I3
C318 D7	LD41 B8	RD05 G9	R309 C6	R713 I3
C321 D5	LD51 E8	RD06 G9	R310 C6	R714 I3
C322 C5	LD61 H8	RD07 G9	R311 C6	R751 H5
C351 B7	LN31 C2	RD08 G9	R312 D6	R752 H5
C352 C7	LN32 F2	RD09 I9	R313 D5	R753 H5
C353 B6	LN33 H2	RD11 H9	R314 D5	R754 H4
C367 B7	L601 D2	RD12 H9	R315 D7	R755 H4
C368 C7	L602 C3	RD13 H9	R316 C7	R756 G4
C371 C5	L611 B2	RD14 H9	R317 C7	R757 H4
C372 B5	L621 G2	RD15 H9	R351 B7	R758 H4
C401 G7	L622 F2	RD16 H9	R352 B7	R759 H4
C402 G7	L631 E2	RD17 H9	R353 B7	R760 G4
C403 F6	L641 I2	RD18 H9	R354 B6	R761 H3
C417 F7	L642 I3	RD21 B8	R355 B6	R762 H3
C418 G7	L651 H2	RD22 B8	R356 B7	R763 H3
C421 G5	QD01 J8	RD26 B9	R357 B6	R764 H3
C422 F5	QD02 I9	RD27 B9	R358 B6	SD71 A2
C451 E7	QD03 G9	RD28 B9	R359 B6	XD01 J8
C452 E7	QD04 G9	RD29 A8	R360 B6	031L B2
C453 E6	QD05 J9	RD30 A8	R361 B6	
C467 E8	QD06 I8	RD33 B8	R362 B6	
C468 E7	QD21 B9	RD34 B8	R363 B5	
C471 F5	QD22 A8	RD41 C9	R364 B5	
C472 E5	QD23 J8	RD42 C9	R365 C7	
C501 J7	QD32 B8	RD43 B8	R366 C7	
C502 J7	QD41 C8	RD44 D8	R367 C8	
C503 I6	QD51 F8	RD45 D8	R401 F7	
C517 I7	QD61 H8	RD46 C8	R402 G7	
C518 I7	QD71 A4	RD51 F9	R403 F7	
C521 J5	QD72 A4	RD52 F9	R404 F6	
C522 I5	QD73 A5	RD53 E8	R405 F6	
C551 H7	QD74 A5	RD54 F8	R406 F7	
C552 H7	QD75 A6	RD55 F8	R407 F6	
C553 G6	QD76 A6	RD56 E8	R408 F6	
C567 H7	QD77 A6	RD61 I9	R409 F6	
C568 H7	QD78 A6	RD62 I9	R410 F6	
C571 H6	Q101 D4	RD63 H8	R411 F6	
C572 G5	Q102 C4	RD64 I8	R412 F6	

A horizontal number line with tick marks labeled 9, 8, 7, 6, 5, 4, 3, 2, 1 from left to right. The segment between 6 and 5 is shaded gray.



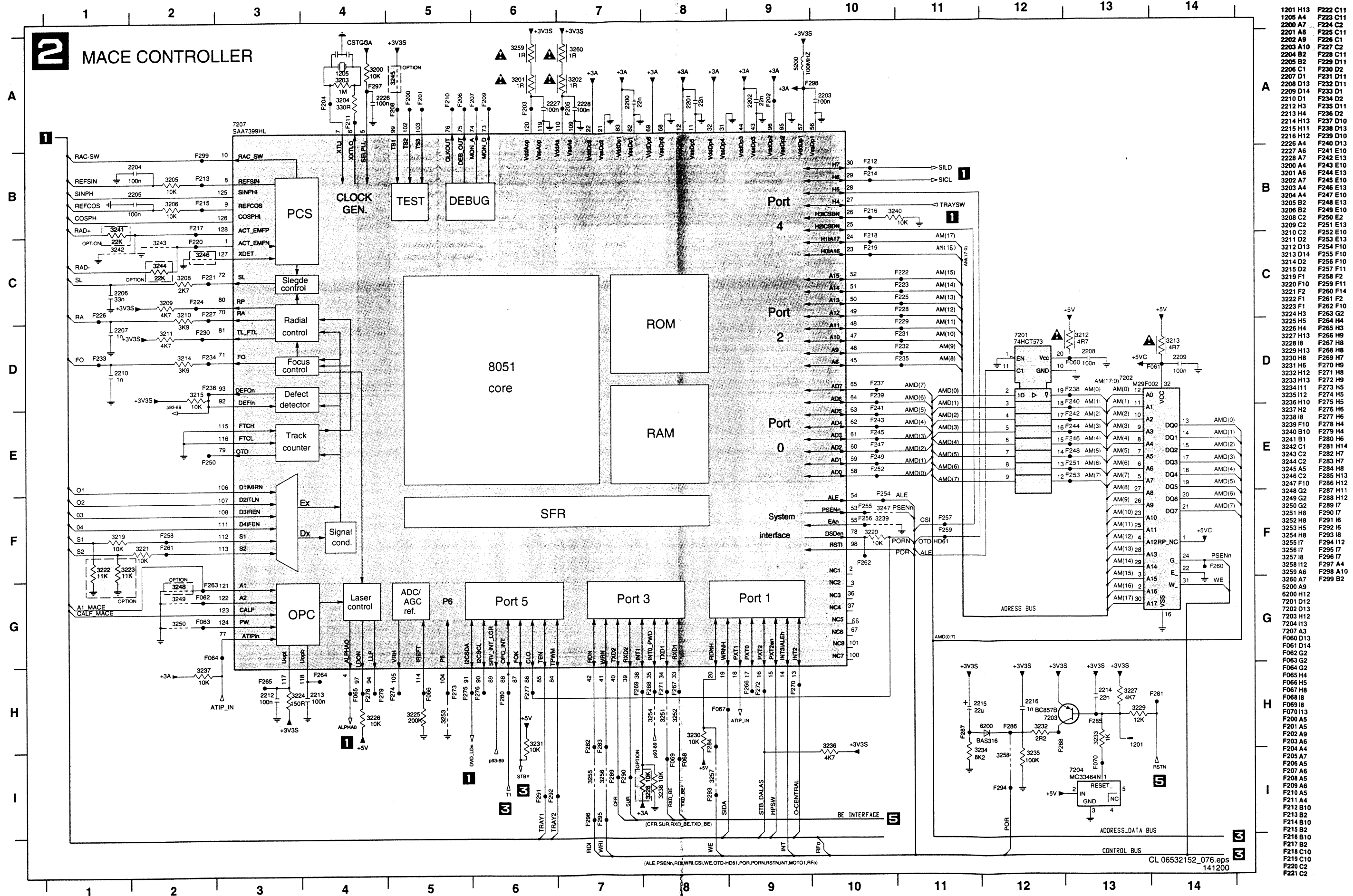
C001	J9	C601	D2	Q103	D4	R065	H8	R413	F5
C002	J8	C602	C2	Q104	D4	R066	H8	R414	F5
C003	J8	C603	C2	Q105	D3	R071	A4	R415	F7
C004	J9	C611	B2	Q106	D3	R072	A4	R416	F7
C005	J9	C612	C2	Q107	C3	R073	A4	R417	F7
C006	G9	C613	B2	Q151	B4	R074	A4	R451	E7
C007	J9	C621	G2	Q152	B4	R075	A4	R452	E7
C008	J9	C622	F2	Q153	B3	R076	A4	R453	E7
C009	J8	C623	F2	Q154	B4	R077	A5	R454	E6
C011	J9	C631	E2	Q155	B3	R078	A5	R455	E6
C012	J9	C632	E2	Q156	C3	R079	A5	R456	E7
C017	H8	C633	E3	Q157	B3	R080	A5	R457	E6
C018	J9	C642	J2	Q201	F4	R081	A6	R458	E6
C019	J8	C643	J2	Q202	F4	R082	A6	R459	E6
C023	J8	C645	J2	Q203	F4	R083	A6	R460	E6
C024	J8	C651	H2	Q204	F4	R084	A6	R461	E6
C040	C8	C652	H2	Q205	G3	R085	A6	R462	E6
C041	B8	C653	H2	Q206	G3	R086	A6	R463	E5
C042	B8	C701	I5	Q207	F3	R087	A6	R464	E5
C043	C7	C702	J5	Q251	E4	R088	A6	R465	E7
C044	C8	C703	J5	Q252	E4	R089	A6	R466	E7
C045	C8	C704	J3	Q253	E4	R090	A6	R467	E8
C046	D8	C705	I4	Q254	E4	R101	D5	R501	I7
C047	C8	C711	J3	Q255	E3	R102	D5	R502	I7
C048	C7	C712	J3	Q256	E3	R103	D5	R503	I7
C049	C8	C751	H5	Q257	E3	R104	D4	R504	I6
C050	F8	C752	H5	Q301	D7	R105	D4	R505	I6
C051	E8	C753	H5	Q302	C7	R106	F4	R506	I7
C052	E9	C754	G3	Q303	D6	R107	D4	R507	I6
C053	F8	C755	H2	Q304	D6	R108	D4	R508	I6
C054	F8	C761	H2	Q305	D6	R109	C4	R509	I6
C055	F8	C762	G2	Q306	D5	R110	C4	R510	I6
C056	F8	D021	A8	Q307	C5	R111	C3	R511	I6
C057	F8	D023	J8	Q351	B7	R112	D3	R512	I6
C058	F8	DN31	C2	Q352	B7	R113	D3	R513	I5
C059	F8	DN32	F2	Q353	B6	R114	D3	R514	I5
C060	I8	DN33	H2	Q354	B6	R151	B5	R515	I7
C061	H8	D101	C4	Q355	B6	R152	B5	R516	I7
C062	H8	D102	C4	Q356	C5	R153	B5	R517	I7
C063	H7	D103	C4	Q357	B5	R154	B4	R551	H7
C064	H8	D151	B4	Q401	F7	R155	B4	R552	H7
C065	I8	D152	B4	Q402	F7	R156	B4	R553	H7
C066	I8	D153	B4	Q403	G6	R157	B4	R554	H6
C067	I8	D201	F3	Q404	G6	R158	B4	R555	H6
C068	I7	D202	F4	Q405	G6	R159	B4	R556	H7
C069	I8	D203	F4	Q406	G5	R160	B4	R557	H6
C071	A2	D251	E4	Q407	F5	R161	B3	R558	H6
C072	A2	D252	E4	Q451	E7	R162	B3	R559	H6
C091	J9	D253	E4	Q452	E7	R163	B3	R560	G6
C092	J9	D301	C6	Q453	E6	R164	B3	R561	H6
C093	A8	D302	C6	Q454	E6	R201	F5	R562	H6
C094	A9	D303	C6	Q455	E6	R202	F5	R563	H5
C095	A5	D351	B6	Q456	F5	R203	F5	R564	H5
C096	A5	D352	B6	Q457	F5	R204	F4	R565	H7
C101	C5	D353	B6	Q501	I7	R205	F4	R566	H7
C102	D5	D401	F6	Q502	I7	R206	F4	R567	H8
C103	D5	D402	F6	Q503	I6	R207	F4	R601	C2
C104	C3	D403	F6	Q504	I6	R208	F4	R602	C2
C105	D4	D451	E6	Q505	I6	R209	F4	R603	C2
C111	D2	D452	E6	Q506	J5	R210	F4	R611	C2
C112	D2	D453	E6	Q507	I5	R211	F3	R612	B2
C151	B5	D501	I6	Q551	H7	R212	F3	R613	C2
C152	C5	D502	I6	Q552	H7	R213	F3	R621	F2
C153	C5	D503	I6	Q553	H6	R214	F3	R622	F2
C154	B3	D551	G6	Q554	H6	R251	E5	R623	E2
C155	C4	D552	G6	Q555	H6	R252	E5	R631	E2
C161	C2	D553	G6	Q556	H5	R253	E5	R632	E2
C162	B2	D601	C2	Q557	G5	R254	E4	R633	E2
C201	F5	D621	I2	Q701	I4	R255	E4	R641	I2
C202	G5	D641	I2	Q702	I4	R256	E4	R642	I2
C203	G5	D701	I4	Q703	I4	R257	E4	R643	I2
C204	F3	D702	I4	Q704	I4	R258	E4	R651	H2
C205	G4	D703	I4	Q705	I3	R259	E4	R652	H2
C211	G3	D704	I4	Q706	J3	R260	E4	R653	H2
C212	F2	D705	G4	Q707	J3	R261	E3	R701	I5
C25	E5	D752	G4	Q751	H4	R262	E3	R702	I5
C252	F5	JD01	J9	Q752	H4	R263	E3	R703	I5
C253	F5	D002	A3	Q753	H4	R264	E3	R704	I4
C254	E3	JD01	D1	Q754	H4	R301	D7	R705	I4
C255	E4	J611	C2	Q755	H3	R302	D7	R706	I4
C261	E2	J621	C2	Q756	H3	R303	D7	R707	I4
C262	E2	J631	E1	Q757	H3	R304	D6	R708	I4
C301	J7	JD41	J1	RD01	J8	R305	D6	R709	I4
C302	D7	JD51	H1	RD02	J9	R306	C7	R710	I4
C303	C6	LD01	J9	RD03	I9	R307	D6	R711	I3
C317	C7	LD02	G9	RD04	G9	R308	C6	R712	I3
C318	D7	LD41	B8	RD05	G9	R309	D6	R713	I3
C321	D5	LD51	E8	RD06	G9	R310	C6	R714	I3
C322	C5	LD61	H8	RD07	B9	R311	C6	R751	H5
C323	B7	LN12	C2	RD08	G9	R312	D6	R752	H5
C352	C7	LN32	F2	RD09	I9	R313	D5	R753	H5
C353	B6	LN33	H2	RD11	H9	R314	D5	R754	H4
C367	B7	LD01	D2	RD12	H9	R315	D7	R755	H4
C368	C7	LD02	C3	RD13	H9	R316	C7	R756	G4
C371	C5	LD11	B2	RD14	H9	R317	C7	R757	H4
C372	B5	LD21	G2	RD15	H9	R351	B7	R758	H4
C401	G7	LD22	F2	RD16	H9	R352	B7	R759	H4
C402	G7	LD31	E2	RD17	H9	R353	B7	R760	G4
C403	F6	LD41	I2	RD18	H9	R354	B6	R761	H3
C417	F7	LD61	I3	RD21	B8	R355	B6	R762	H3
C418	G7	LD51	H2	RD22	B8	R356	B7	R763	H3
C421	G5	QD01	J8	RD26	B9	R357	B6	R764	H3
C422	F5	QD02	A9	RD28	B9	R358	B6	S071	A2
C452	E7	QD04	G9	RD29	A8	R359	B6	X001	J8
C453	E8	QD05	J9	RD30	A8	R360	B6	O311	B2
C457	E8	QD06	I8	RD33	B8	R362	B6		
C468	E7	QD21	B9	RD34	B8	R363	B5		
C471	F5	QD22	A8	RD35	A8	R364	B5		
C472	E5	QD23	J8	RD42	C9	R365	C7		
C501	J7	QD32	B8	RD43	B8	R366	C7		
C502	J7	QD41	C8	RD44	D8	R367	C8		
C503	I6	QD51	F8	RD45	D8	R401	F7		
C517	I7	QD61	H8	RD46	C8	R402	G7		
C518	I7	QD71	A4	RD51	F9	R403	F7		
C521	I5	QD72	A4	RD52	F9	R404	F6		
C522	I5	QD73	A5	RD53	E8	R405	F6		
C551	H7	QD74	A5	RD54	F8	R406	F7		
C552	H7	QD75	A6	RD55	F8	R407	F6		
C553	G6	QD76	A6	RD56	E8	R408	F6		
C567	H7	QD77	A6	RD61	I9	R409	F8		
C568	H7	QD78	A6	RD62	I9	R410	F6		
C571	H5	Q101	D4	RD63	H8	R411	F6		
C572	G5	Q102	C4	RD64	I8	R412	F6		

DVD ALAS



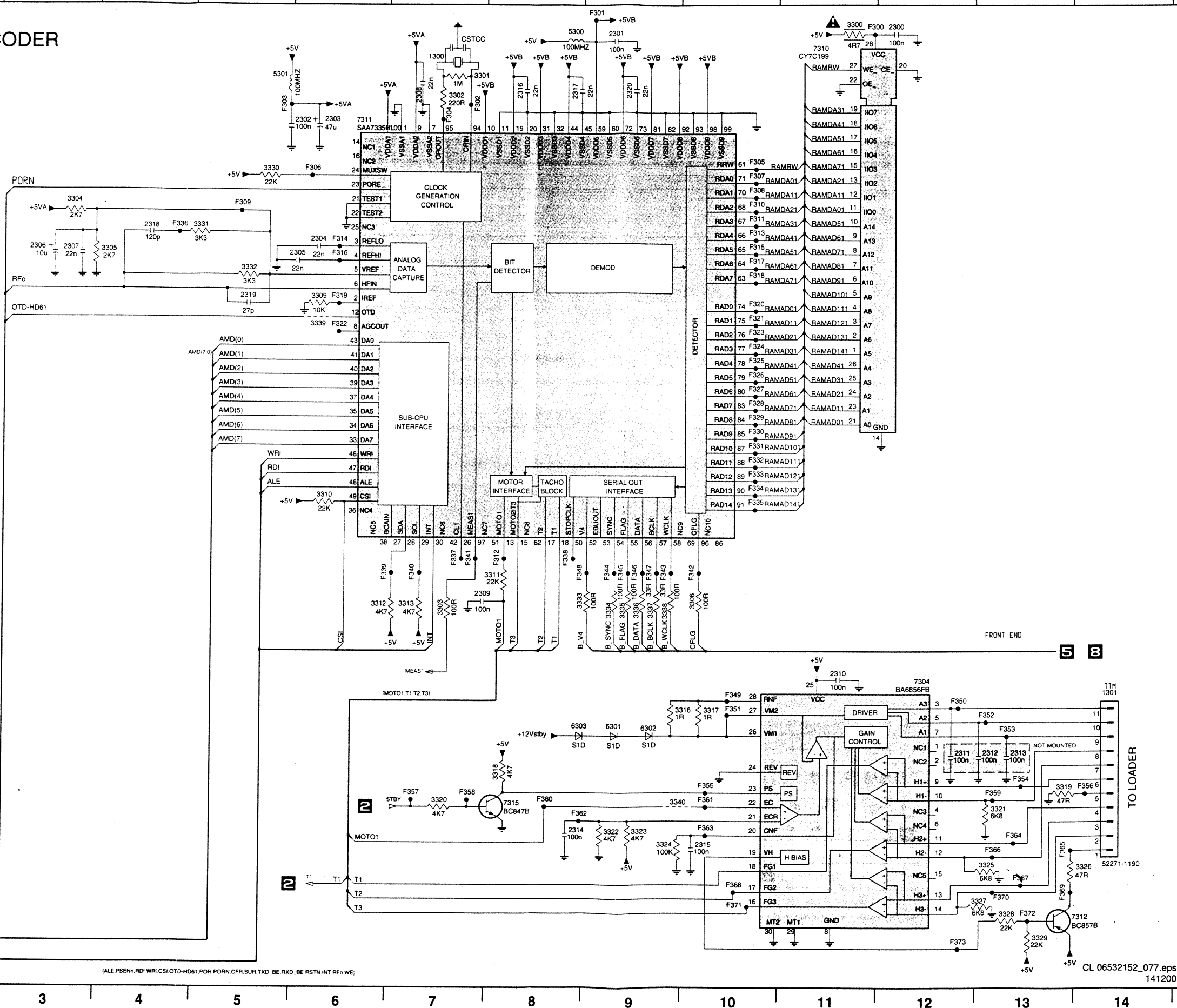
CL 06532152_075.eps
141200

2 MACE CONTROLLER



Mono board: CD - DVD decoder

3 CD - DVD DECODER



1300 A7 F348 F8
1301 G14 F349 G10
2300 A12 F350 G12
2301 A9 F351 G10
2302 A6 F352 G13
2303 A6 F353 G13
2304 B6 F354 H13
2305 C6 F355 H10
2306 C3 F356 H14
2307 C3 F357 H7
2308 A7 F358 H7
2309 F7 F359 H13
2310 G11 F360 H8
2311 H12 F361 H10
2312 H13 F362 H8
2313 H13 F363 H10
2314 H8 F364 H13
2315 I10 F365 I13
2316 A6 F366 I13
2317 A8 F367 I13
2318 B4 F368 I10
2319 C5 F369 I13
2320 A9 F370 I13
3300 A11 F371 I10
3301 A7 F372 I13
3302 A7 F373 I12
3303 F7
3304 B3
3305 C4
3306 F10
3309 C6
3310 E6
3311 F8
3312 F6
3313 F7
3316 G10
3317 G10
3318 H8
3319 H13
3320 H7
3321 H13
3322 H9
3323 H9
3324 I9
3325 I13
3326 I14
3327 I13
3328 I13
3329 I13
3330 B5
3331 B5
3332 C5
3333 F8
3334 F9
3335 F9
3336 F9
3337 F9
3338 F9
3339 C6
3340 H9
5300 A8
5301 A5
6301 G9
6302 G9
6303 G8
7304 G12
7310 A11
7311 A6
7312 I13
7315 H8
F300 A11
F301 A9
F302 A7
F303 A5
F304 A7
F305 B10
F306 B6
F307 B10
F308 B10
F309 B5
F310 B10
F311 B10
F312 F8
F313 B10
F314 B6
F315 C10
F316 C6
F317 C10
F318 C10
F319 C6
F320 C10
F321 C10
F322 C6
F323 C10
F324 D10
F325 D10
F326 D10
F327 D10
F328 D10
F329 D10
F330 D10
F331 E10
F332 E10
F333 E10
F334 E10
F335 E10
F336 B4
F337 F7
F338 F8
F339 F6
F340 F7
F341 F7
F342 F10
F343 F9
F344 F9
F345 F9
F346 F9
F347 F9

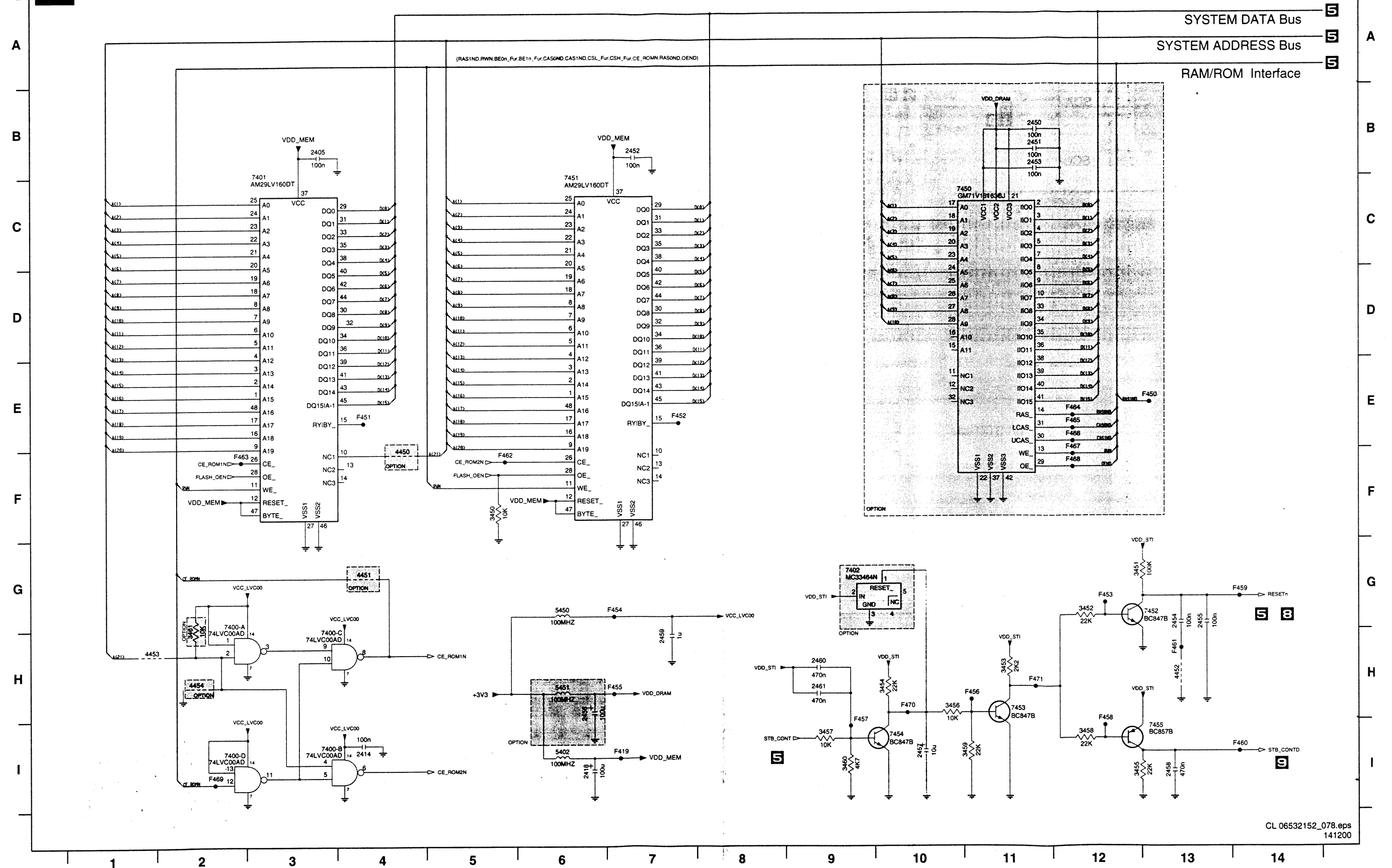
FRONT END

5 8

TO LOADER

CL 06532152_077.eps
141200

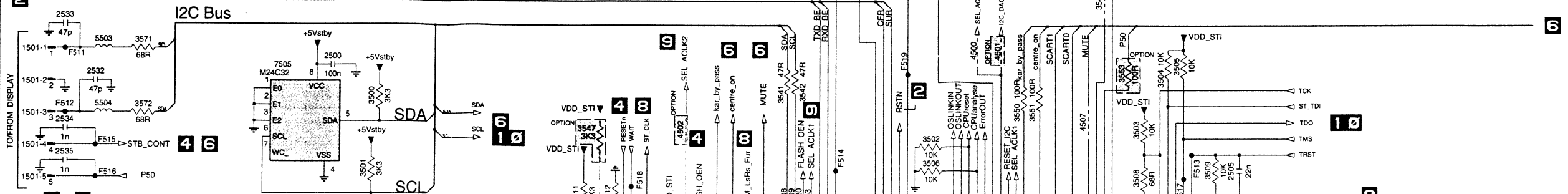
Mono board: Program memories

4 PROGRAM MEMORIES

Mono board: CPU & MPEG decoder

5 CPU & MPEG DECODER

2 BASIC ENGINE INTERFACE Bus



4 8 SYSTEM ADDRESS Bus

SYSTEM DATA Bus

4 8

RAM/ROM Interface

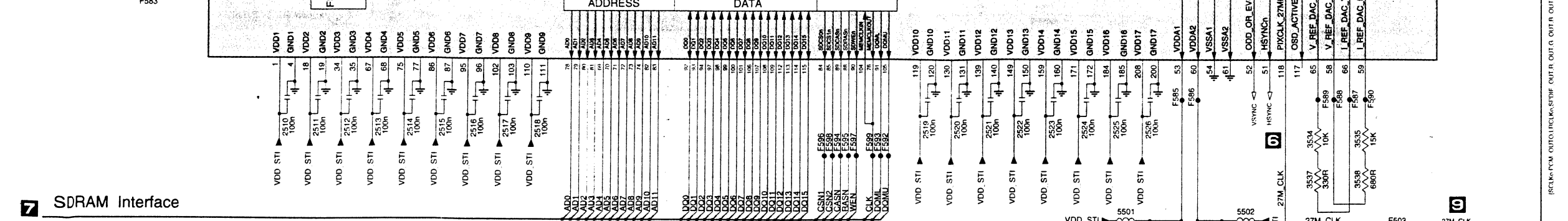
4 8

FRONT END

3

SDRAM Interface

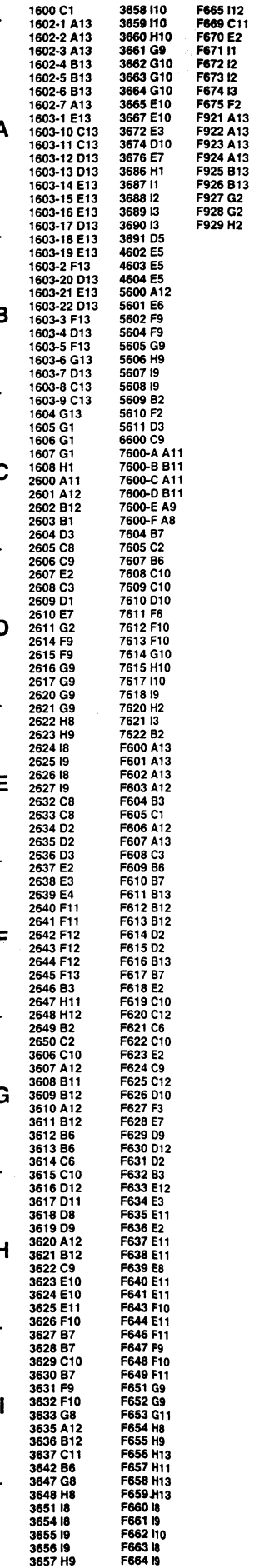
7



1501-1 A1	F520 C8
1501-2 B1	F521 C10
1501-3 B1	F522 C11
1501-4 B1	F524 C10
1501-5 B1	F525 C11
2500 A3	F528 C7
2504 C11	F527 C7
2505 B12	F528 C11
2506 D14	F529 C8
2507 D14	F530 C10
2508 E14	F531 C10
2509 E14	F532 C10
2510 H3	F533 C10
2511 H3	F534 C10
2512 H4	F535 C5
2513 H4	F536 C6
2514 H4	F537 C11
2515 H4	F538 C6
2516 H5	F539 C7
2517 H5	F540 C6
2518 H5	F541 C12
2519 H9	F542 C9
2520 H9	F543 C7
2521 H9	F544 C9
2522 H10	F545 C9
2523 H10	F546 C9
2524 H10	F547 C9
2525 H11	F548 C8
2526 H11	F549 C9
2528 H11	F552 C7
2529 H11	F553 C8
2530 H11	F554 C8
2531 H11	F555 C6
2532 A1	F556 C12
2533 A1	F557 C12
2534 B1	F558 D14
2535 B1	F559 E14
2536 B1	F560 E14
2537 B1	F561 E14
2538 B1	F562 E14
2539 B1	F563 E14
2540 A11	F567 F14
2541 B1	F568 F13
2542 B1	F569 F13
2543 B1	F570 F14
2544 B1	F571 G14
2545 B1	F572 G14
2546 B1	F573 G2
2547 B1	F574 G2
2548 B1	F575 G2
2549 B1	F576 G2
2550 B1	F577 G2
2551 B1	F578 G2
2552 B1	F579 G2
2553 B1	F580 G2
2554 B1	F581 G2
2555 B1	F582 G2
2556 B1	F583 G2
2557 B1	F584 H11
2558 B1	F585 H11
2559 B1	F586 H11
2560 B1	F587 H11
2561 B1	F588 H12
2562 B1	F589 H12
2563 B1	F590 H13
2564 B1	F591 H13
2565 B1	F592 H13
2566 B1	F593 H13
2567 B1	F594 H13
2568 B1	F595 H13
2569 B1	F596 H13
2570 B1	F597 H13
2571 B1	F598 H13
2572 B1	F599 H13
2573 B1	F599 H13

6 PWR SUPPLY + OUTPUT INTERFACES

5 SERIAL PC INTERFACE



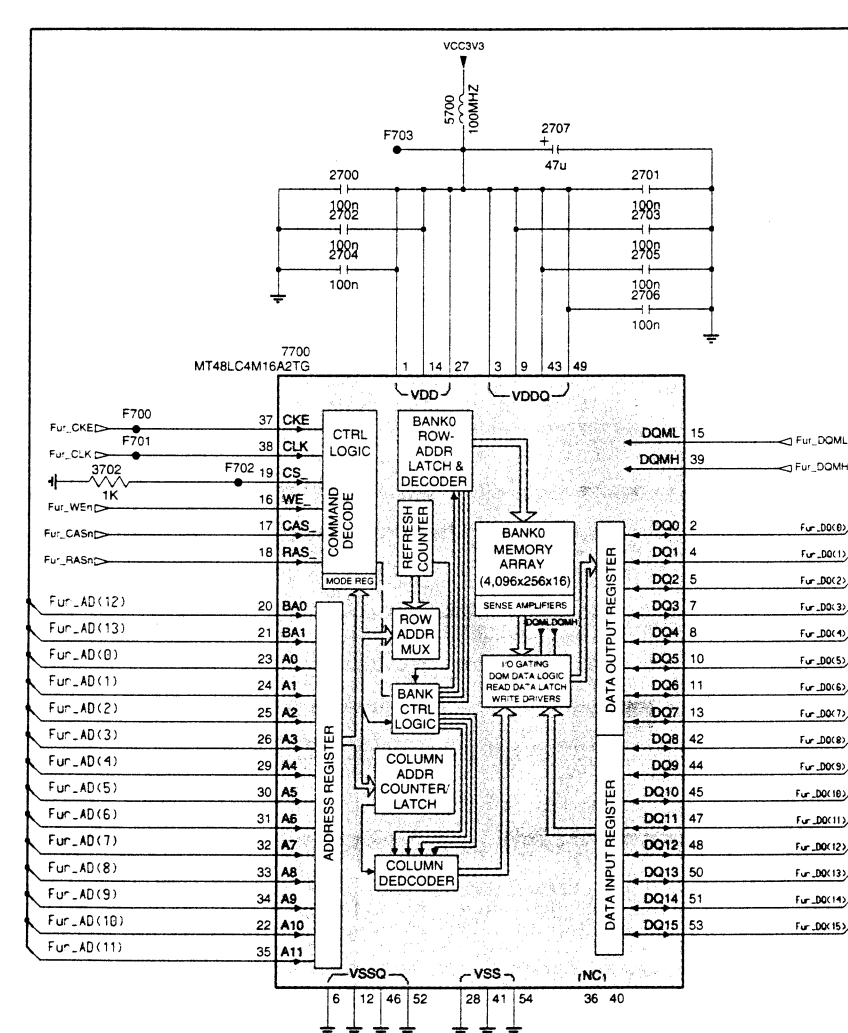
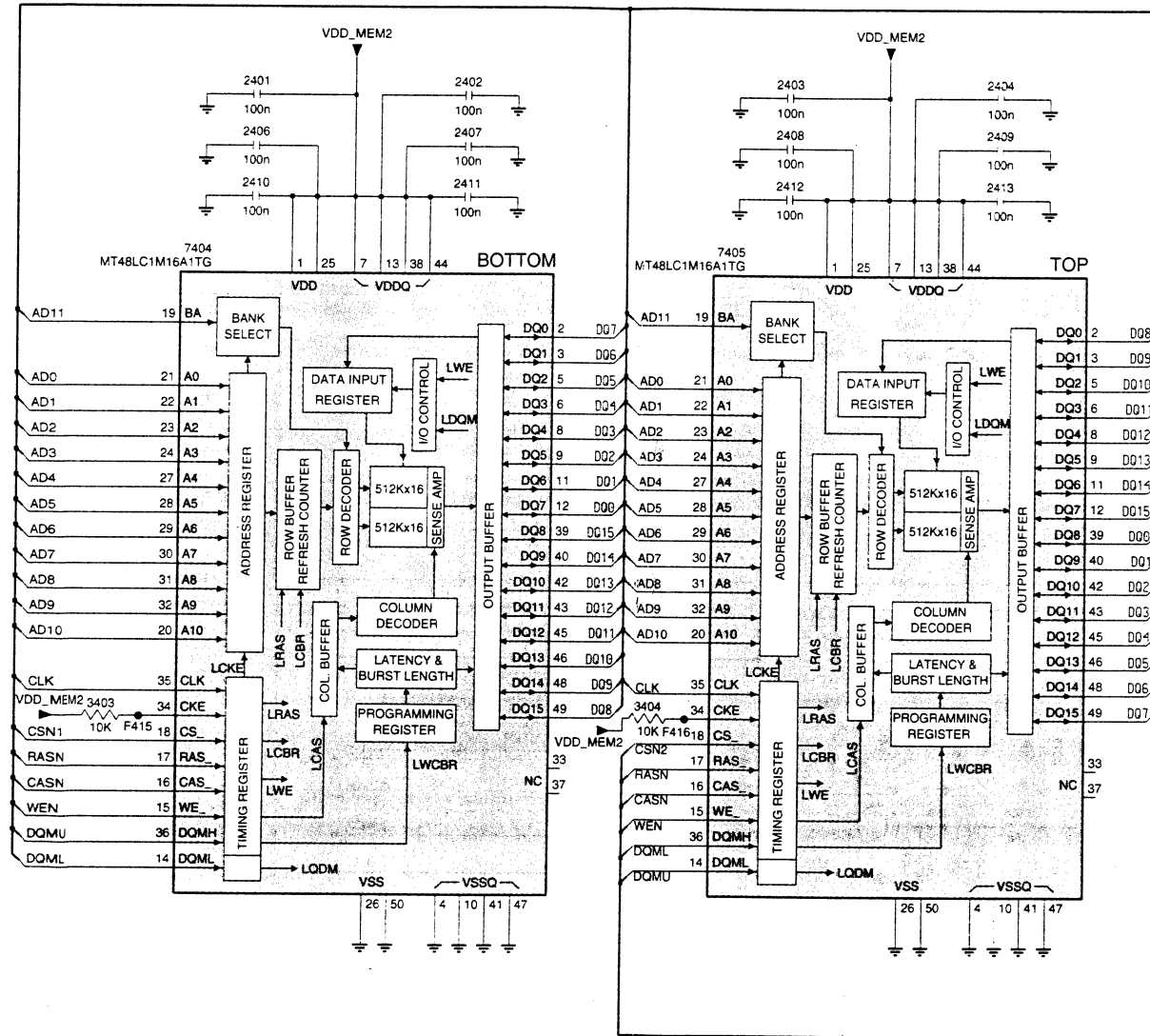
Mono board: SD RAM's

7 SDRAMs

ST SDRAM

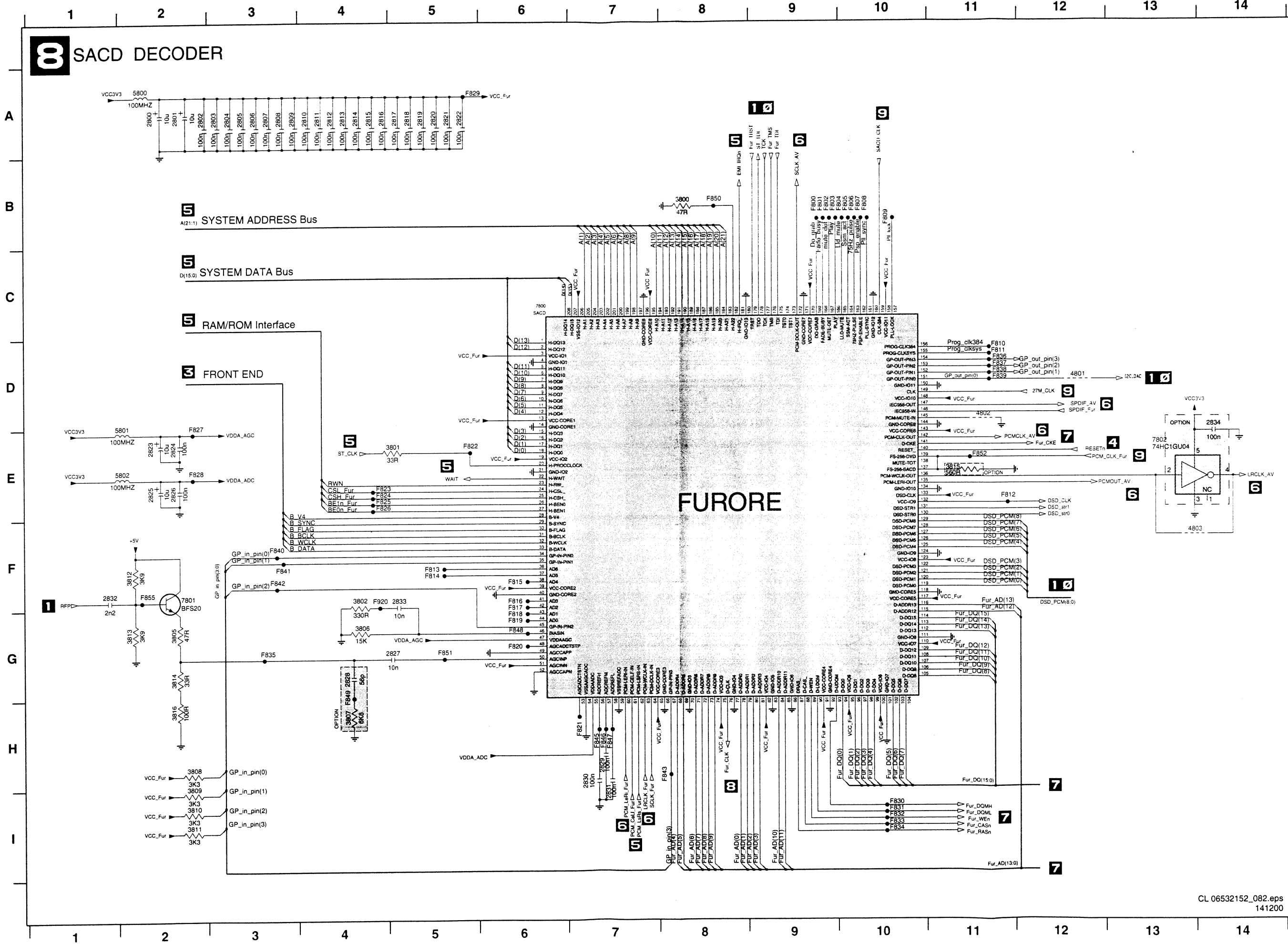
FUORE SDRAM

SDRAM Interface



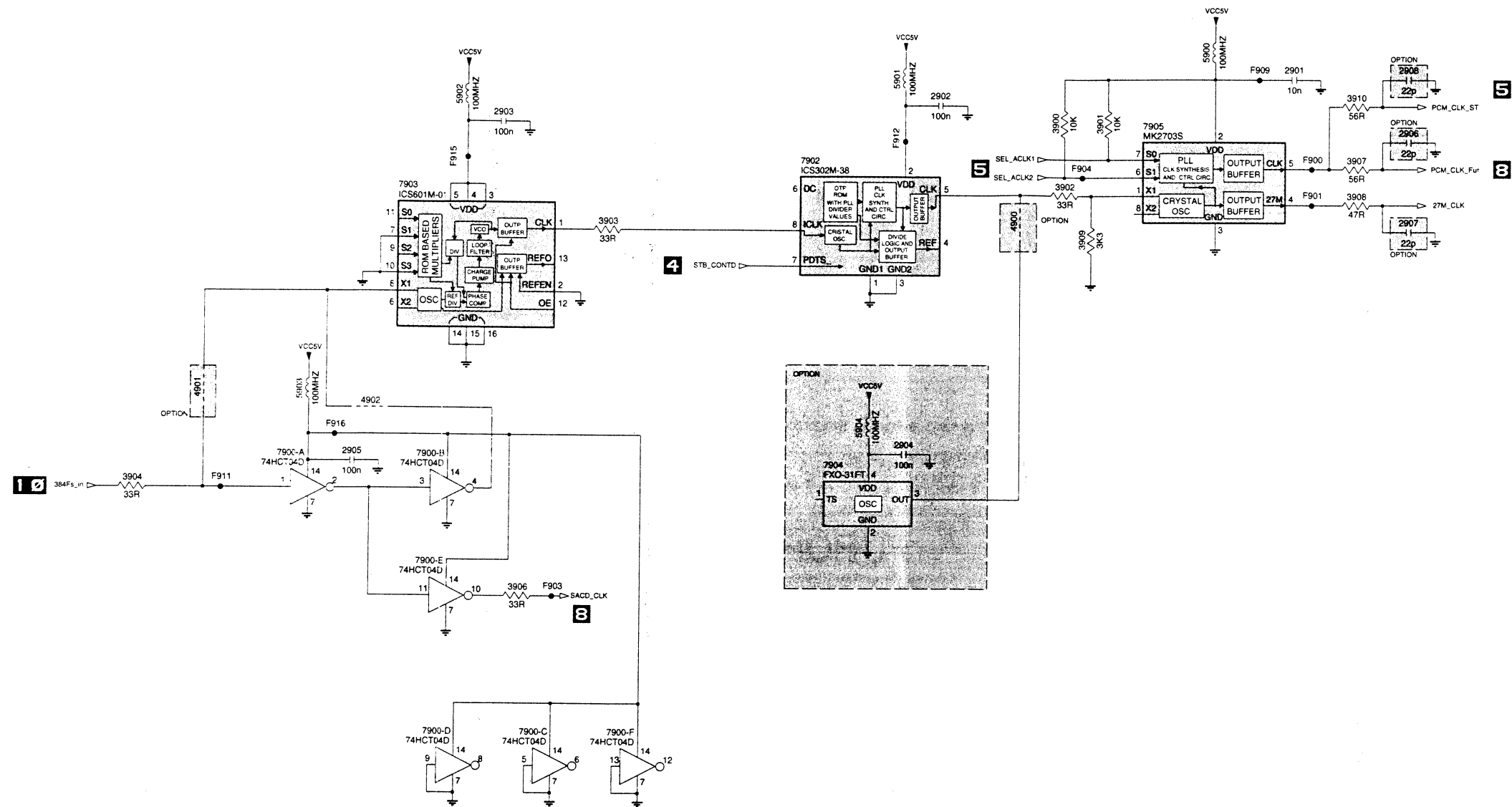
Mono board: SACD decoder

8 SACD DECODER



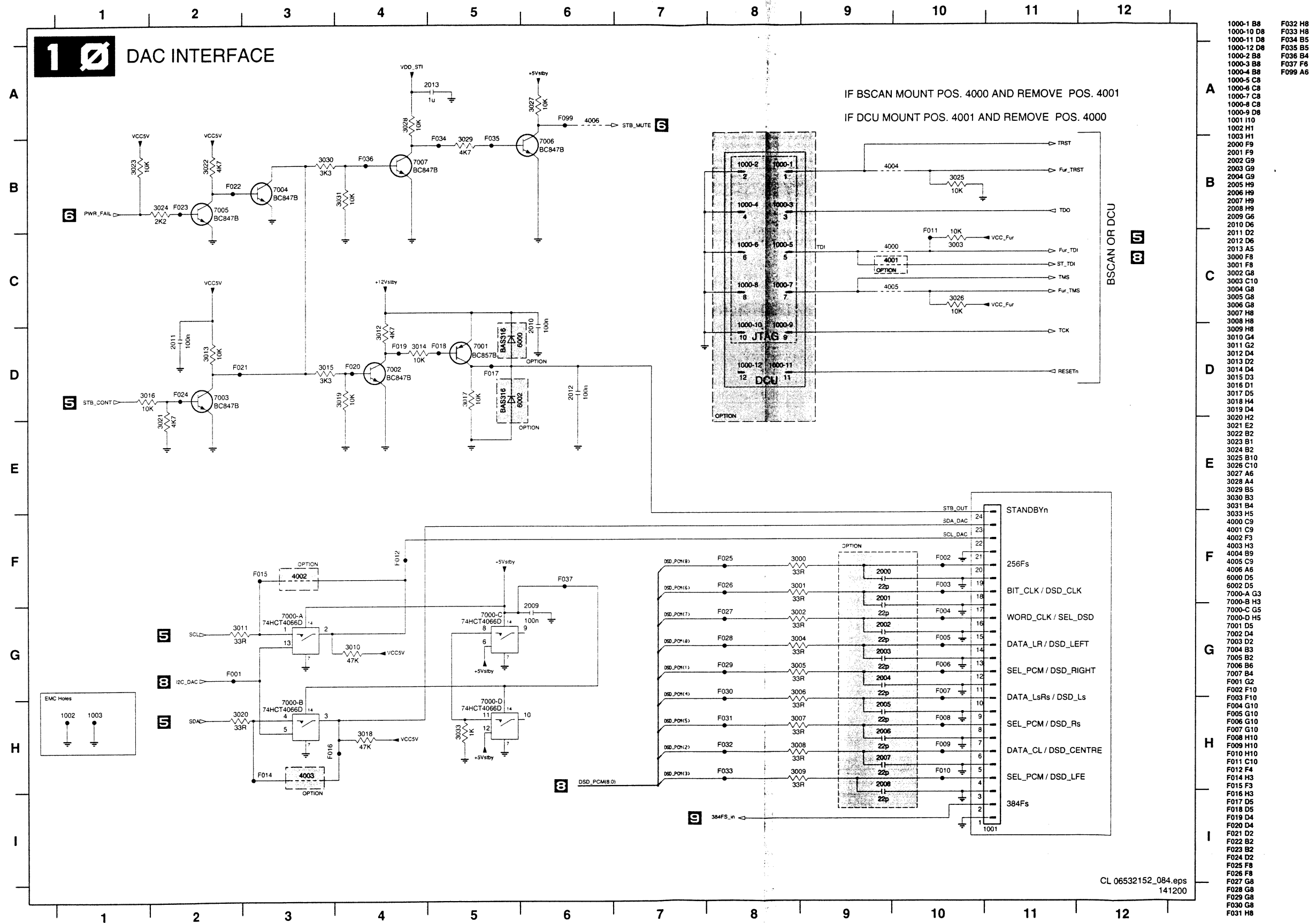
2800 A2
2801 A2
2802 A2
2803 A3
2804 A3
2805 A3
2806 A3
2807 A3
2808 A3
2809 A3
2810 A4
2811 A4
2812 A4
2813 A4
2814 A4
2815 A4
2816 A4
2817 A5
2818 A5
2819 A5
2820 A5
2821 A5
2822 A5
2823 E2
2824 E2
2825 E2
2826 E2
2827 G5
2828 G4
2829 H7
2830 H7
2831 I7
2832 F1
2833 F5
2834 E14
3800 B8
3801 E5
3802 F4
3805 G2
3806 G4
3807 H4
3808 H2
3809 I2
3810 I2
3811 I2
3812 F2
3813 G2
3814 G2
3815 E11
3816 H2
4801 D12
4802 D11
4803 F13
5800 A2
5801 E2
5802 E2
7800 C6
7801 F2
7802 E13
F800 B9
F801 B9
F802 B9
F803 B9
F804 B10
F805 B10
F806 B10
F807 B10
F808 B10
F809 B10
F810 D11
F811 D11
F812 E11
F813 F5
F814 F5
F815 F6
F816 F6
F817 G6
F818 G6
F819 G6
F820 G6
F821 H7
F822 E5
F823 E4
F824 E4
F825 E4
F826 E4
F827 E2
F828 E2
F829 A5
F830 I10
F831 I10
F832 I10
F833 I10
F834 I10
F835 G3
F836 D11
F837 D11
F838 D11
F839 D11
F840 F3
F841 F3
F842 F3
F843 H8
F845 H7
F846 H7
F847 H7
F848 G6
F849 G4
F850 B8
F851 G5
F852 E11
F855 F2
F920 F4

9 SYSTEM CLOCKS

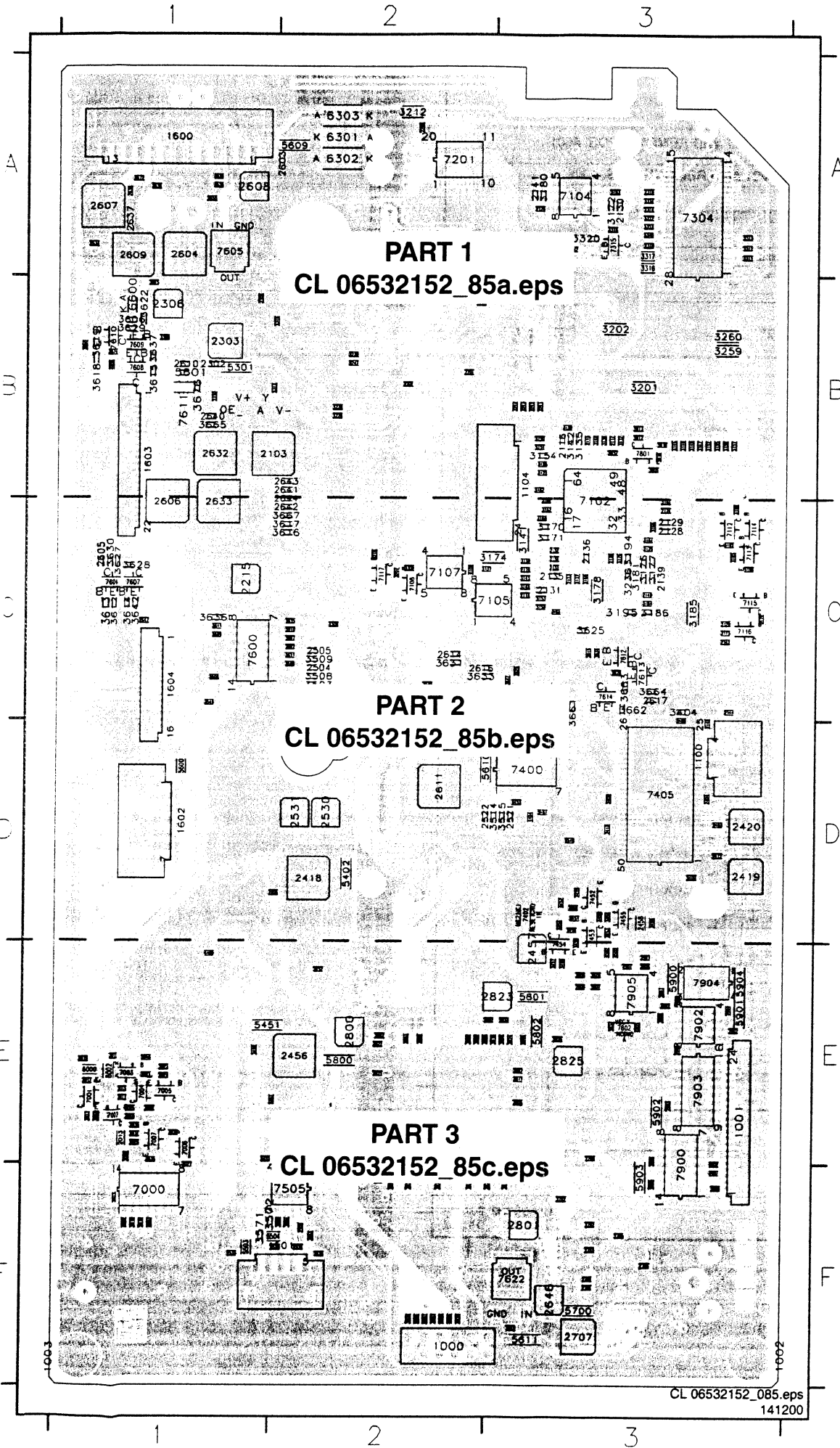


2901 B11
2902 C9
2903 C5
2904 E8
2905 E4
2906 C12
2907 D12
2908 B12
2909 C10
2910 C10
2912 C10
2903 D6
2904 F2
2906 F5
2907 C12
2908 C12
2909 D10
2910 C12
2900 C9
2901 E3
2902 E4
2903 E3
2904 E8
2900-A E3
2900-B E4
2900-C H5
2900-D H4
2900-E F4
2900-F H6
2902 C7
2903 C4
2904 E8
2905 C10
2906 C10
2901 C12
2903 F5
2904 C10
2909 B11
2911 F3
2912 C8
2915 C5
2916 E4

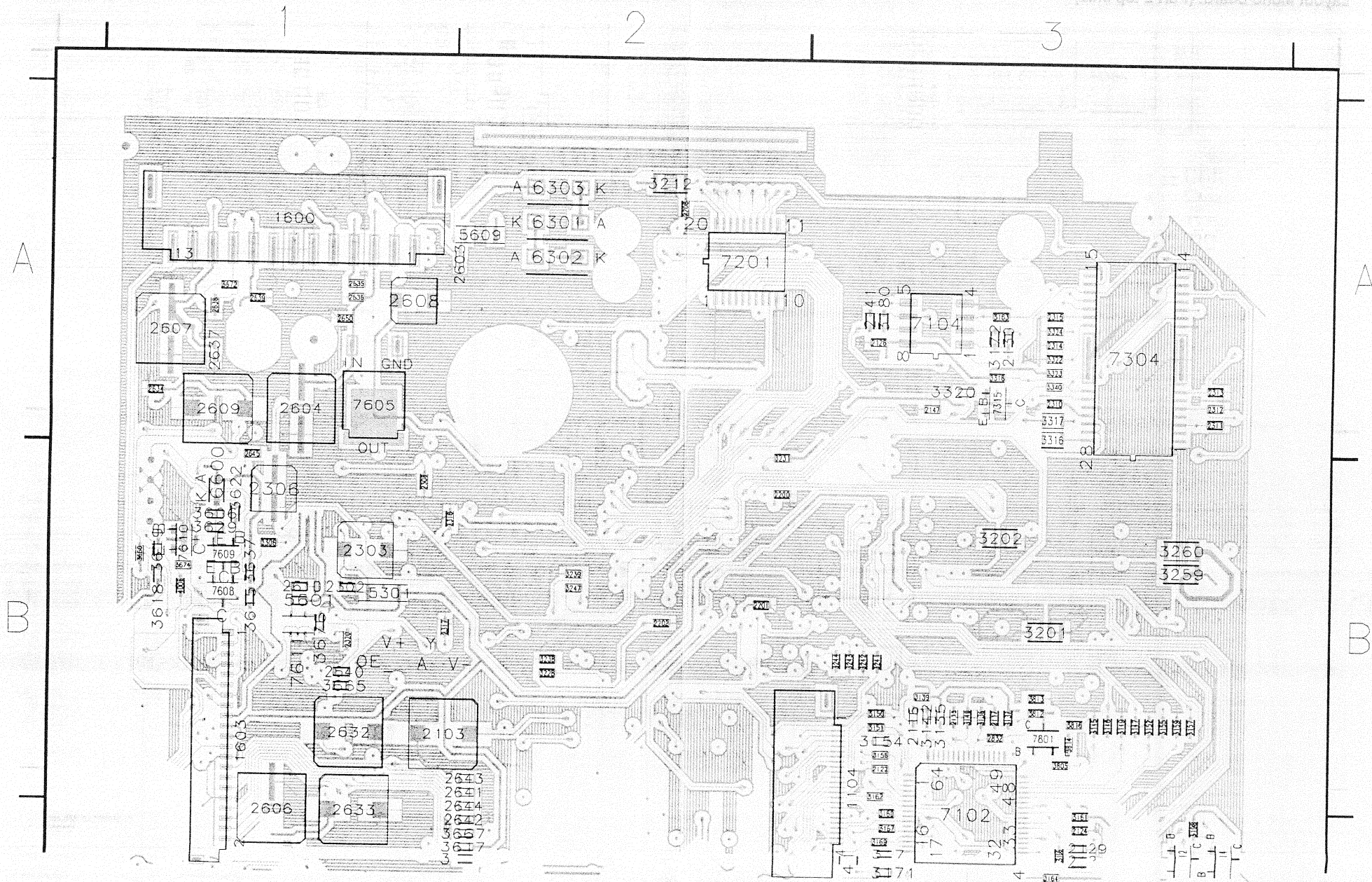
1 DAC INTERFACE



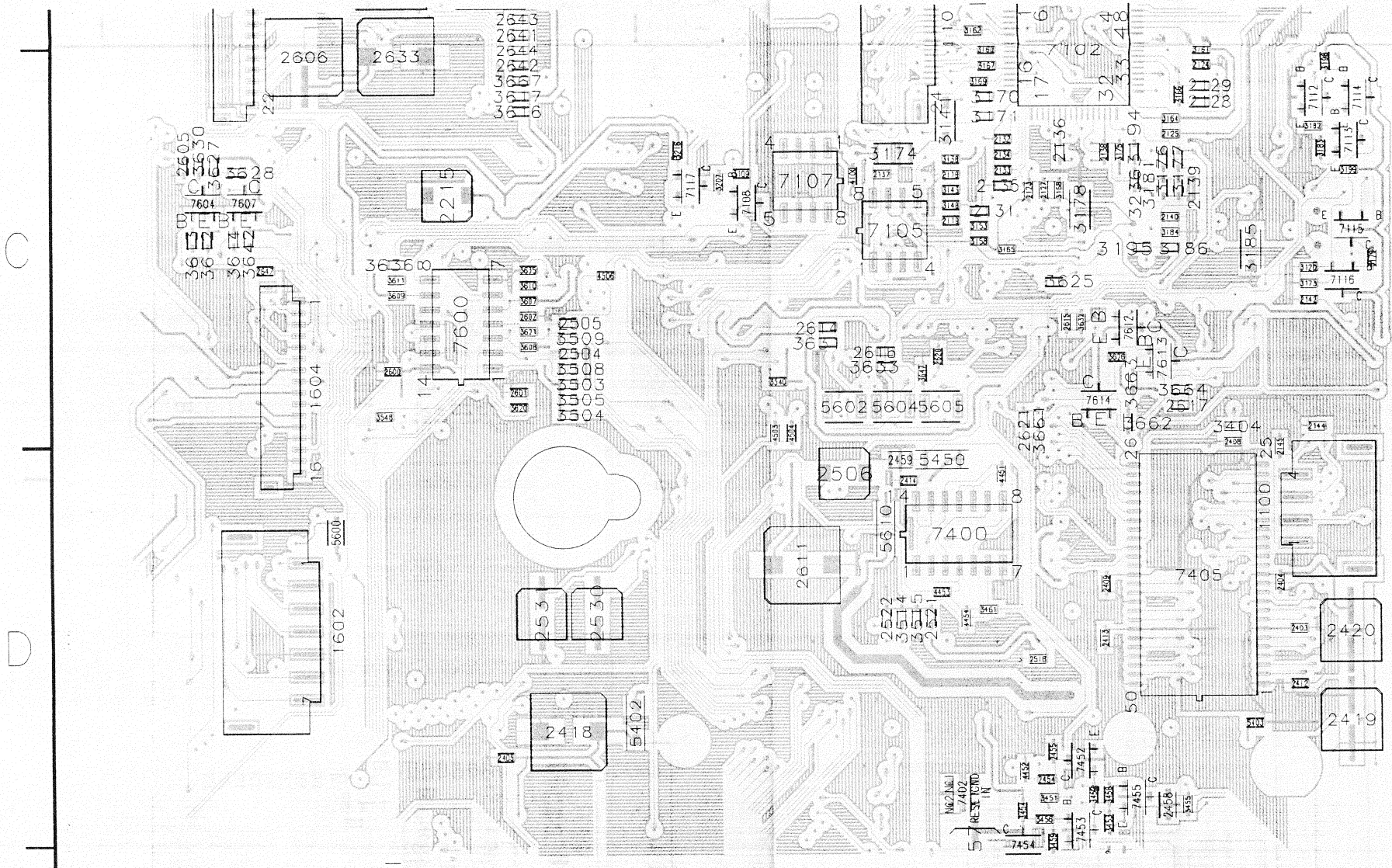
Layout Mono board: (overview top side)



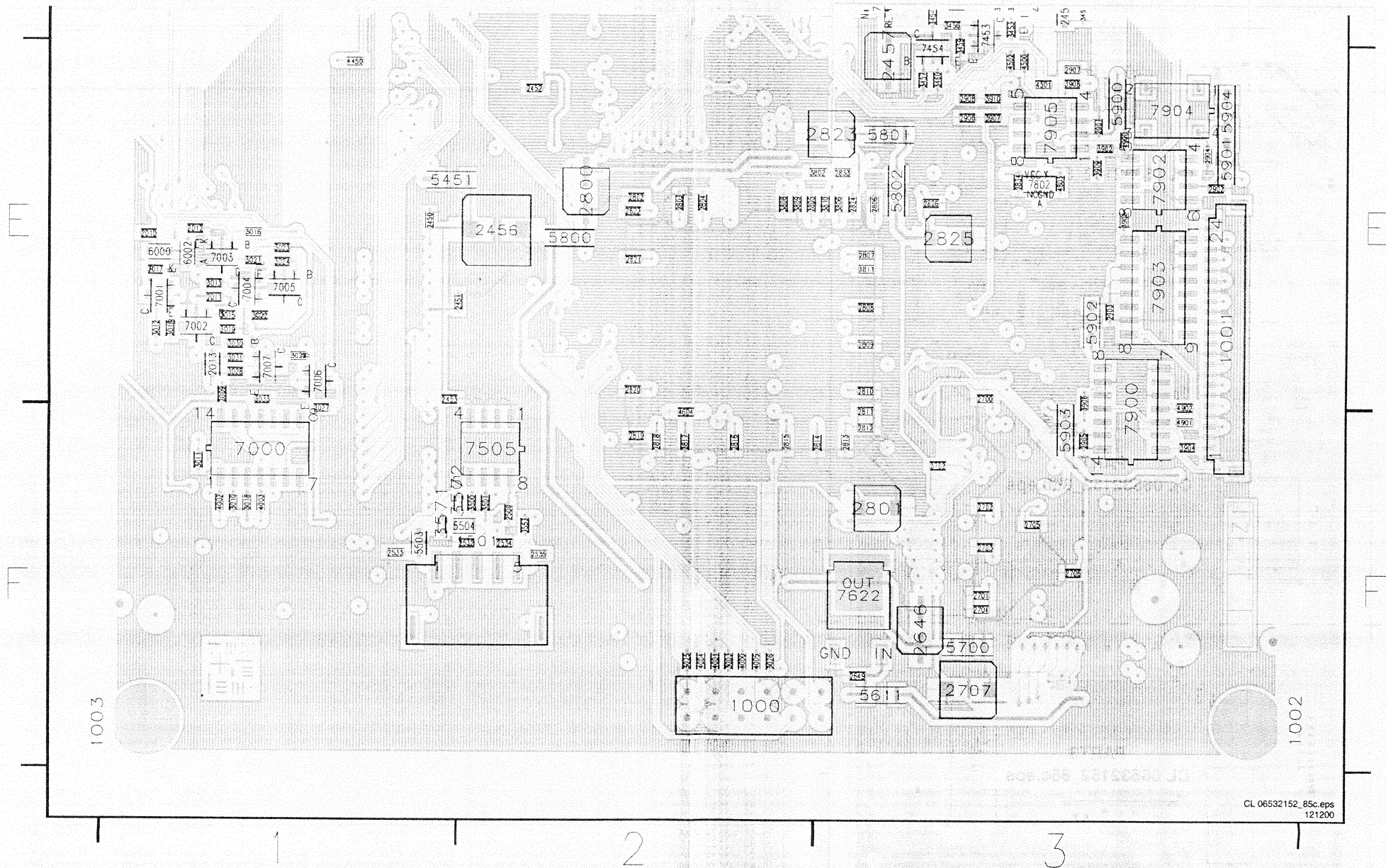
Layout Mono board: (Part 1 top side)



Layout Mono board: (Part 2 top side)



Layout Mono board: (Part 3 top side)



PART 1
CL 06532152_86a.eps

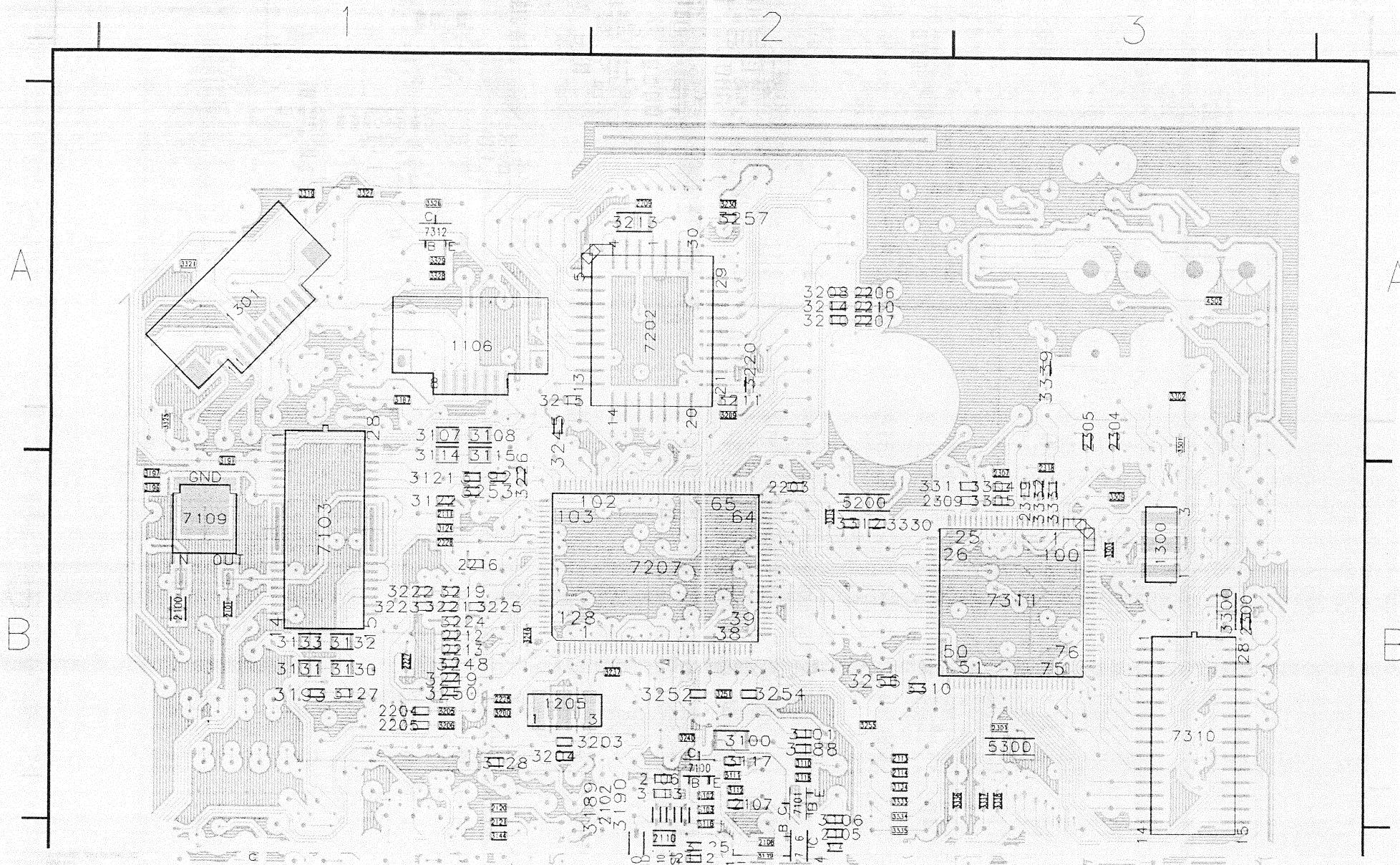
PART 2
CL 06532152_86b.eps

PART 3
CL 06532152_86c.eps

CL 06532152_086.eps
141200

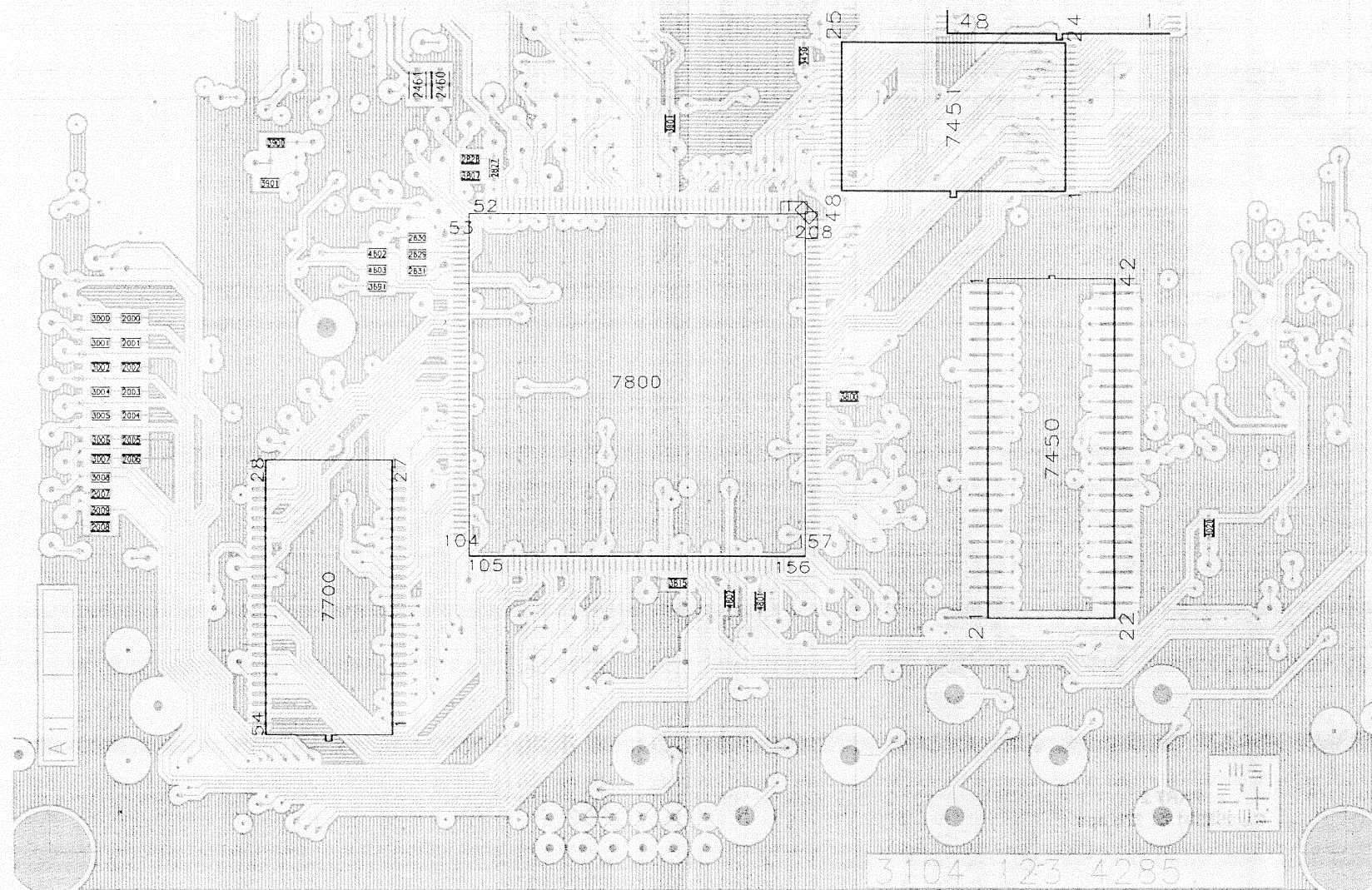
CL 06532152_086.eps
141200

Layout Mono board: (Part 1 bottom side)

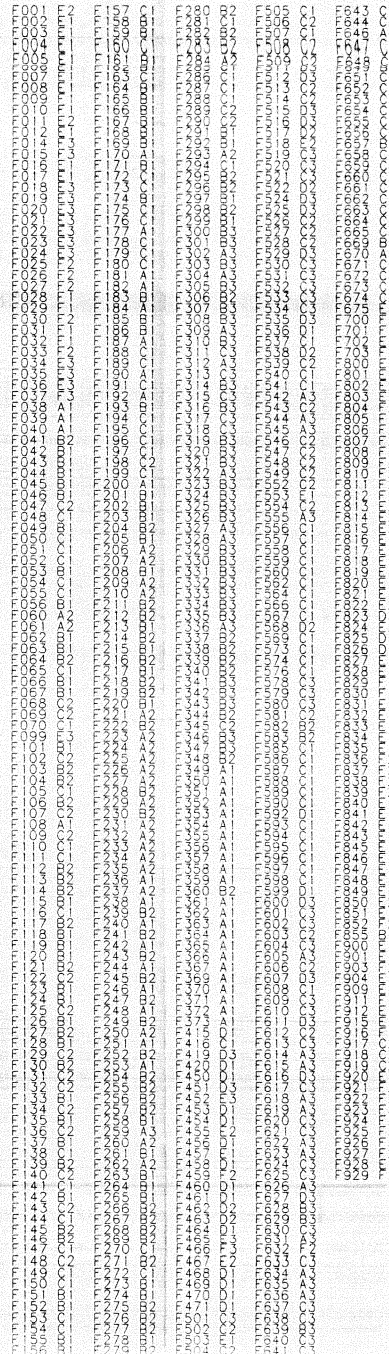
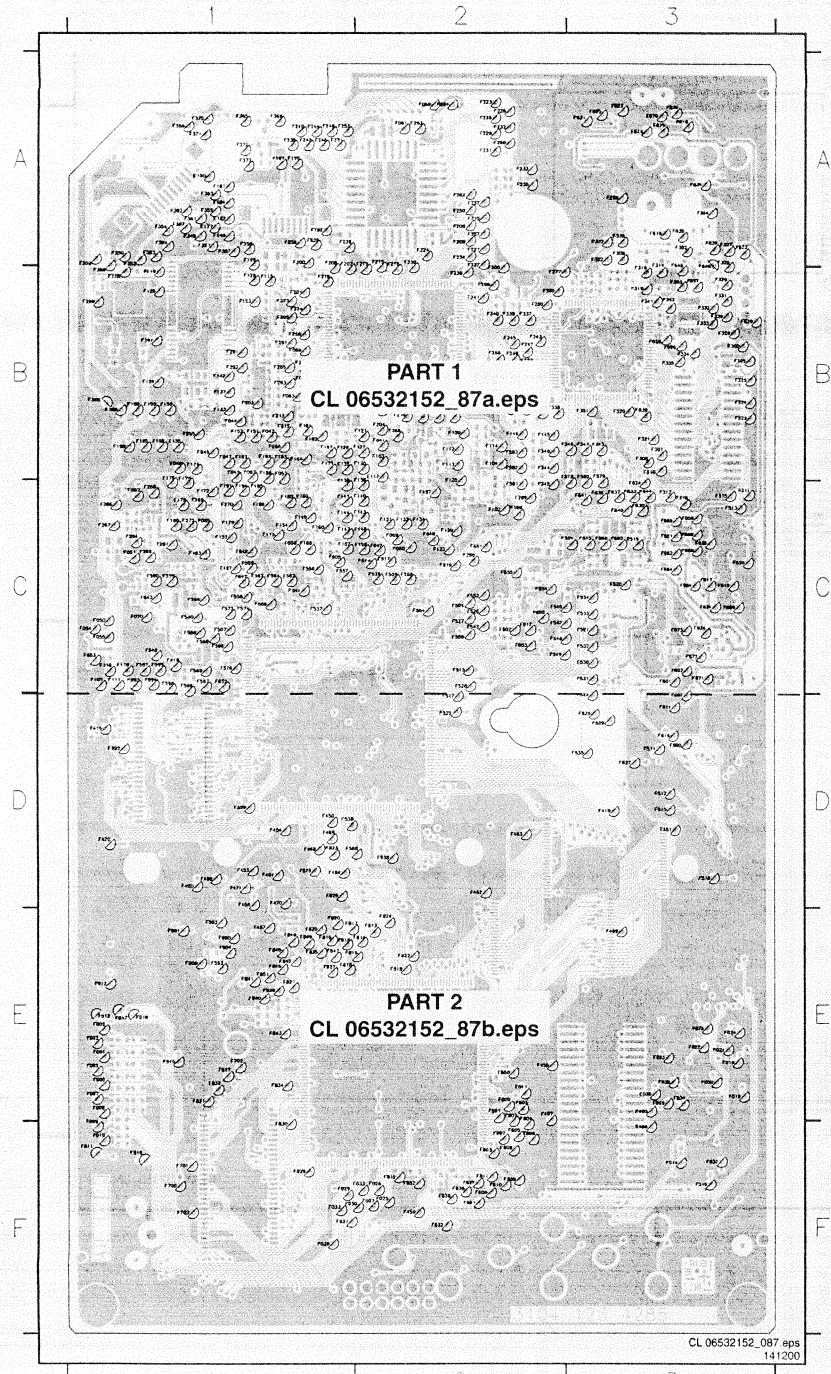




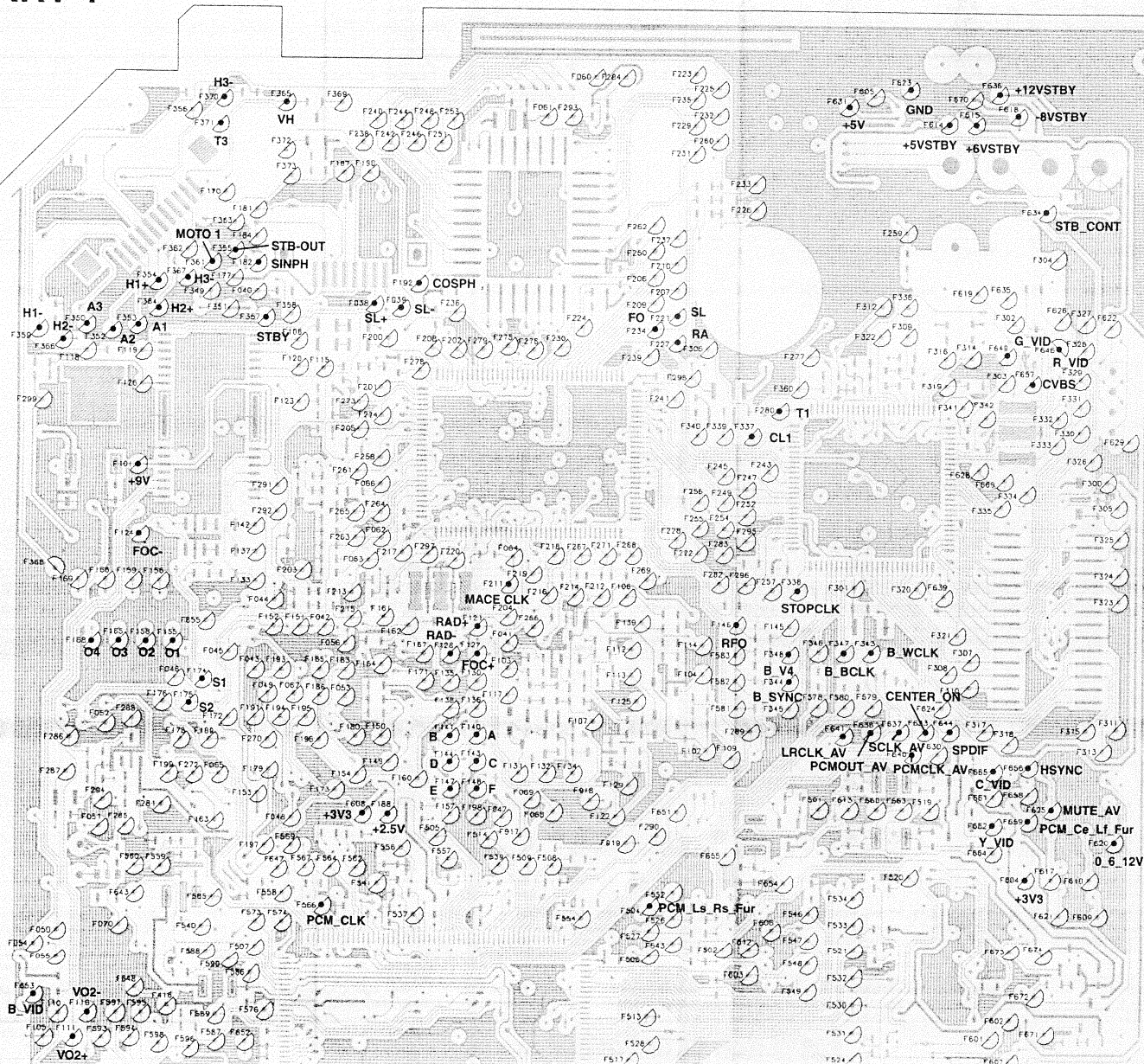
Layout Mono board: (Part 3 bottom side)



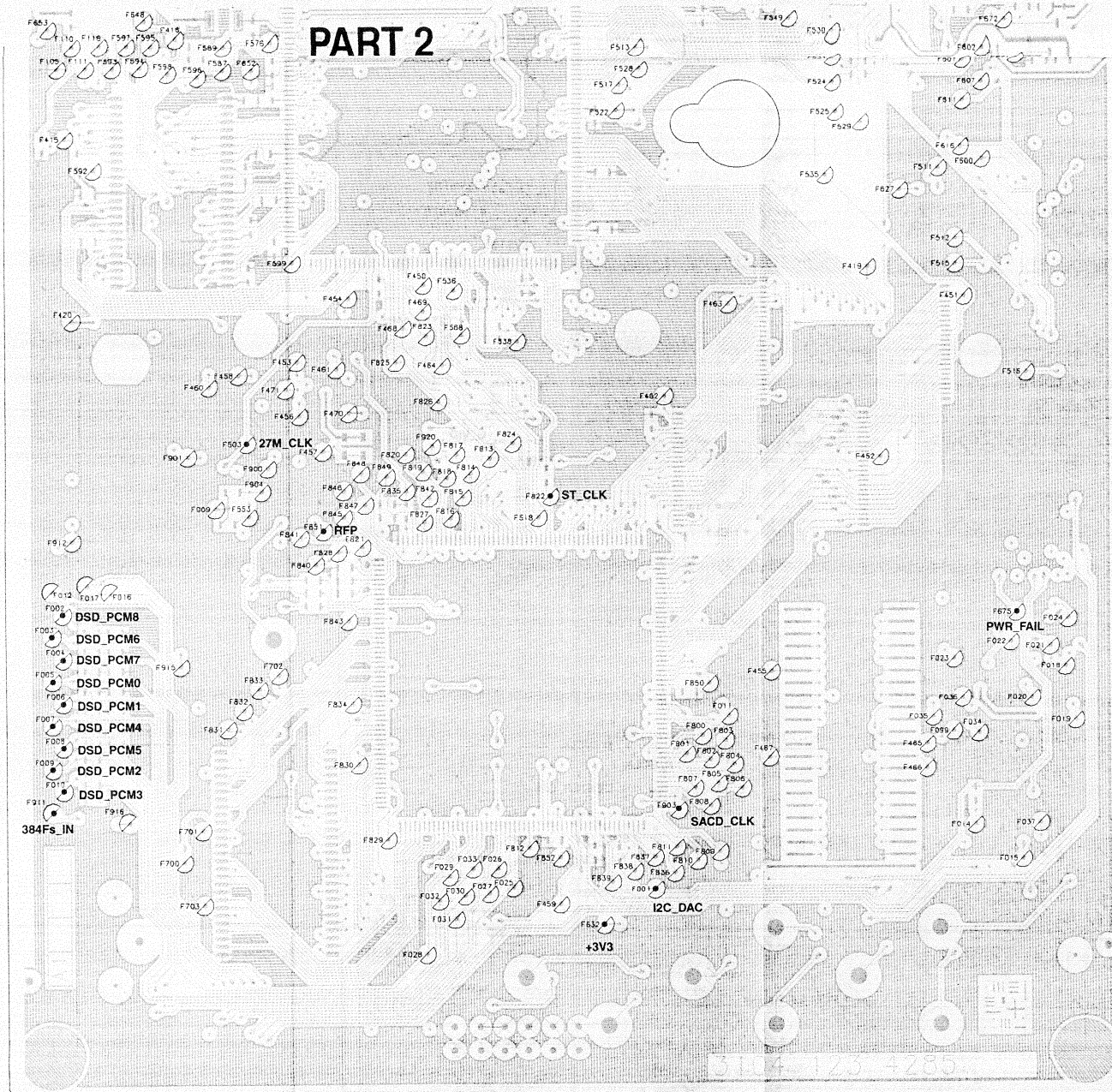
Layout Mono board: (overview testpoints)



PART 1



Layout Mono board: (Part 2 Test points)



8. Alignments

No alignments available

9. Circuit-, IC descriptions and list of abbreviations

9.1 SAA7399 (MACE2) General.

Mace2 is a name used for the successor of the ACE1 IC. The term MACE (mini-ACE) is used because MACE2 does not have a decoder on board. Application area's: Mainly CD-R(W) and prototyping of DVD(-ROM) or high speed CD-ROM.

Functions implemented on-board of MACE2:

A further improved digital servo module. Derived from the ACE1 servo module, but with improvements (make the input switchable between diode signal and error signal processing, improved brake).

The 80C51 micro-controller with external ROM.

The OPC. Optimum Power calibration, used for CDR.

The PCS. Position Control Sledge. A way to speed up sledge movement using hall sensors.

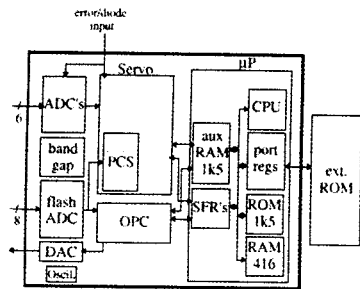


Figure 9-1 Overall block diagram MACE2.

9.2 Features

- Focus and Radial servo loop.
- Built-in access procedure.
- Selectable servo error or servo diode inputs.
- Focus noise performance equivalent to DSICS
- Automatic closed loop gain control available for focus and radial loops
- High speed track crossing velocity measurement > 350 kHz.
- Fast Radial Brake circuitry.
- Sledge motor servo loop, with pulsed sledge support and PCS
- Incorporated micro-controller equivalent to 80C51 --> 66MHz.
- *Programmable wait state controller.*
- *Two embedded RAM's of 416 bytes and 1.5 kB res.*
- Optimum Power Calibration Hardware support up to write at N=8.
- Debug facilities.
- Memory mapped interface to sub-modules.
- Programmable clock multiplier.
- 8 Multipurpose I/O lines.
- 5 external interrupt lines.
- External Flash ROM support.

- Sledge stepper motor support.

9.3 The Digital Servo block.

In a CD system, there are some 12 control loops active. About six of them are needed to adjust the servo error signals, that is once per disc rotation offsets, signal amplitudes and loop gains (AGC's) are adjusted to enlarge system robustness and to avoid expensive potentiometer adjustments in production. The other six loops determine the laser spot position on the disc in the radial, axial (focus) and tangential directions. The servo in MACE2 takes care of these controls.

The servo inside Mace2 also has to take care that the spot accesses a required position as fast as possible. This access system consists of two parts, namely the actuator and the sled, which are within a certain range, mechanically and electrically independent. So during an access the servo has to control as well the actuator as the sled.

9.4 Functional description servo

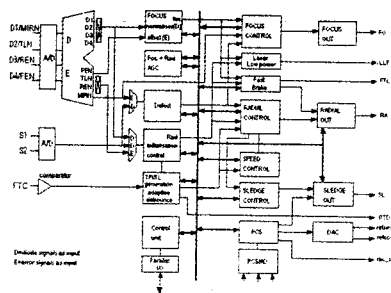


Figure 9-2 Mace2 servo block diagram.

The following functions can be distinguished:

- A to D conversion: a direct AD-conversion of the diode/error currents.
- Pulse density D to A conversion: Noise shaper output stages.
- Control unit: Provides mainly the communication and on/off functions.
- Focus normaliser: A partial division of focus and sum signal. Special saturating provisions are included when dividing through very small numbers.
- *Initialisation control.* includes the radial normaliser, automatic radial offset compensation and level initialisation for the Track Position Indicator (TPI) for both diode and error input signals.
- TPI/TL generation and adaptive debounce: Generates Track loss (TL) which is protected against disc defects. The TL is made out of the unprotected TPI signal. The debouncer (with improved debounce times) minimises the disturbing effect of HF on the TL and Rp crossovers for the track count circuitry.

- Defect detector: Holds the focus and/or radial control signal on disc dropouts.
- Speed control: Used during access. With radial actuator feed forward.
- Focus control: PID controller with wide range adjustable characteristics.
- Radial control: PID controller with wide range adjustable characteristics.
- Sledge control: PID controller with wide range adjustable characteristics and a pulsed sledge controller.
- Laser Low Power: Switches the laser from write back to read power whenever the device tends to go off-track.

9.5 Input circuits servo

Five out of six of the MACE2 servo inputs can be switched between diode current inputs (for audio and data application) and error signal inputs (for recordable applications). The analogue signals from the diode pre processor are converted into a digital representation using A/D converters.

9.6 Focus control.

9.6.1 Focus start-up.

To bring the actuator in focus position a triangular shaped voltage is applied to the actuator to perform a search movement. When the lens moves from or to the disc, CA (central aperture) is monitored to reach a certain programmable absolute level. When this value is CA level is reached, the FOK signal becomes true and FEn is passed to the FEn level detector.

At the moment this FEn level is reached the wait for the focus mode is entered and the focus control loop is enabled to detect a sign inversion in the FEn signal.

When this zero crossing in this FEn signal is detected, the loop is closed to function as PID controlled loop and is switched to the PID mode.

During focus start-up a dither signal is added to the output signal of the integrator. It prevents the actuator from hitting its natural resonance. With this technique quantisation, effects are compensated for during start-up.

9.6.2 Focus Position Control loop.

The focus control loop contains a digital PID controller that has 5 parameters available to the user. These coefficients influence the integrating, proportional and differential action of this PID and a digital low pass filter following the PID. The fifth coefficient influences the loop gain.

9.6.3 Dropout detection.

This detector can be influenced by one parameter. The FOK signal will become false and the integrator of the PID will hold if the CA signal drops below this programmable absolute CA level. When the FOK signal becomes false, it is assumed as caused by a black dot in the first place.

9.6.4 Focus Loss detection and Fast restart.

Whenever FOK is false longer than about 2 ms, it is assumed that the focus point is lost. A fast restart procedure is initiated which is capable of restarting the focus loop within 200 to 300 ms depending on the uP-programmed coefficients.

9.6.5 Focus Automatic Gain Control loop.

The loop gain of the focus control loop can be corrected automatically to eliminate tolerances in the focus loop. This gain control injects a signal into the loop that is used to

correct the loop gain. Since this decreases the optimal performance, the gain control should only be activated shortly (for instance when starting a new disc).

9.7 Radial control.

The MACE2 digital controller includes the following radial servo functions:

9.7.1 Level initialisation:

During start-up an automatic adjustment procedure is activated to set the values of the radial error gain, offset and satellite sum/MIRN signal gain for TPI level generation. The initialisation procedure runs in a radial open loop situation and is < 200 ms. This start-up time period may coincide with the last part of the turntable motor start-up time period.

9.7.2 Automatic gain adjustment:

Because of this initialisation the amplitude of the RE signal is adjusted within $\pm 10\%$ around the nominal RE amplitude. Offset adjustment: The additional offset in RE due to the limited accuracy of the start-up procedure is less than ± 50 nm.

9.7.3 TPI level generation:

The accuracy of the initialisation procedure is such that the duty cycle range of TPI becomes $0.4 < \text{duty cycle} < 0.6$.

Sledge home:

Sledge moves to reference position at the inner side of the disc with user defined voltage.

Tracking control:

The actuator is controlled using a PID loop filter with user defined coefficients.

Access:

In Mace2 there are two fundamentally different ways to perform an access:

Using the PCS

A more detailed description of this access method is given in an other section.

Using the servo controlled access:

The way it was done in the predecessors of Mace2. This access procedure is divided into 3 different modes, depending on the requested jump size:

access type size access speed

Actuator jump decreasing velocity

Sledge jump maximum power to sledge 1

Controlled sl. jump controlled brake power

The access procedure makes use of a track counting mechanism, a velocity signal based upon the number of tracks passed within a fixed time interval, a velocity setpoint calculated from the number of tracks to go and a user programmable parameter indicating the maximum sledge performance.

If the number of tracks to jump is too large, then the Sledge jump mode is activated, else the actuator jump is performed. The requested jump size together with the required sledge braking distance at maximum access speed defines the value of the maximum numbers of tracks.

During the actuator jump mode, velocity control with a PI controller is used for the actuator. The sledge is then continuously controlled using the filtered value of the integrator contents of the actuator. All filter parameters (for actuator and sledge) are user programmable.

In the sledge jump mode maximum power (user programmable) is applied to the sledge in the correct direction, while the actuator becomes idle.

Radial Automatic Gain Control loop:

The loop gain of the radial control loop can be corrected automatically to eliminate tolerances in the radial loop. This gain control injects a signal into the loop which is used to correct the loop gain. Since this decreases the optimal performance the gain control should only be activated shortly (for instance when starting a new disc). This gain control differs from the earlier mentioned level initialisation. This level initialisation should be done first. The level initialisation without the gain control reduces tolerances from the front-end only.

9.8 The radial PID.

Since we are dealing with a big variety of applications and drives, the servo controllers in MACE2 should be adjustable within a large frequency range.

In order to read out the track properly - a track consists of sequential ordered data pit's which hold audio, video or ROM data - the focus and radial position controls must follow the moving track within some tenths of a micrometer, despite of disc imperfections and external disturbances.

For instance, a rotating disc causes, due to track eccentricity, track unroundness, or disc skew, track movements up to some millimetres. The control loop reduces this to about one tenth of a micrometer.

9.9 Initialisation control.

Due to optical, electrical and mechanical tolerances in CD players, properties of the servo signals such as offset and gain can vary. In general, without proper signal processing, a simple PID controller function cannot cope with this relatively large offset and gain spreads. Therefore, gain and offset adjustments during manufacture or active control, to compensate for these signal imperfections, become inevitable.

Adjustment procedures in the factory are expensive. So, automatic adjustment procedures have been implemented in order to avoid most of the potentiometer adjustments. In the MACE2 servo automatic adjustments are applied to the radial error signal only.

9.10 The AGC.

The Automatic Gain Control is used in the MACE2 digital servo to adjust the radial and focus bandwidths to a nominal value. Injecting a signal in the loop and measuring the phase of its resulting signal (wobble method) does this.

Principle of the Automatic Gain Control.

The principle of the Automatic Gain Control (AGC) circuit, as used in MACE2, is drawn in the next figure.

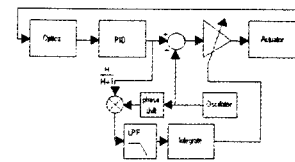


Figure 9-3 Principle of the automatic gain control.

A sine wave signal with a certain frequency is injected in the control loop at the summation point. The resulting signal is

measured before the injection point. The injected signal is shaped by $H/(1+H)$. This measured signal is multiplied by a phase shifted version of the injected signal. The result of the multiplication is low pass filtered and integrated. (The integrator is started at the nominal gain of the control loop). The result of the integration is fed to the adjustable loop gain. This principle, synchronous detection, is also known as 'wobble method'.

9.11 The Fast brake.

The fast brake is an aid to speed up radial capture after a high-speed jump. It is a separate radial control with a much higher bandwidth. The radial control output can be switched between fast brake mode and original radial control mode. The fast brake helps the radial actuator at the end of a jump to "stick" to the right track. In fast brake mode, the actuator starts to follow the track movements. It's a bit like jumping on a moving train. If you run as fast as the train, you can just step in. After a radial open loop jump the tracks are moving (as a result of eccentricity) at a very high speed underneath the radial actuator. This speed is too high for a normal radial control loop to do radial capture. When the radial control is switched over to fast brake mode for a short term, this moving of the tracks underneath the actuator becomes much slower, (because the actuator follows the track movement), so when you switch back to original radial control, it's much easier to do radial capture.

9.12 The Defect Detector.

Because of the possible earlier mentioned defects (fingerprints, etc) a defect detection circuit is incorporated into the MACE2 servo. If a defect is detected, the radial and focus error signals may be zeroed, resulting in better playability.

9.12.1 Operation:

The defect detector prevents the light spot from going out of focus and going off track due to disc dropout excitations. The defect detector can be switched on and off under software control and can be applied to the focus control only, or both to the focus and radial control.

Whenever this circuit detects a defect, it will hold all radial and focus controls.

The hold signal is generated whenever the reflected light intensity drops rapidly (< 1.5 ms) down to roughly 75% of the actual intensity level. In that case the output of the comparator becomes active and controls the focus and radial signal switch.

This circuit improves the playability of the application (black dot performance, etc) and is programmable to optimise it for specific disc defects. The actions of this circuit can be monitored on the DEFO pin (active high).

An external defect detection circuit can be added by removing the connection between DEFO and DEFI (normal operation) and inserting the external circuitry.

These signals are afflicted with some uncertainties caused by:

- Disc defects like scratches and fingerprints
- The HF information on the disc, which is considered as noise by the detector signals.

9.13 Laser Drive On.

The LDON pin is used to switch the laser drive off and on. It is an open drain output. In case the laser is on, the output has a high impedance. The pin will be automatically driven if the focus control loop is switched on.

9.14 Laser Low Power (LLP).

The LLP output can be used by writeable systems to switch the laser back to read power when the light spot goes off-track while writing discs. To prevent that the neighbour tracks are damaged when the spot goes off-track the laser has to be switched very fast to the safe read power. The laser is not switched off (like LDON does), so the system can carry on reading.

The tracking (radial) and focus error signals are used to disable the laser write power. This is done through the LLPn, active low Laser Low Power, signal. Note that LLPn is a servo output, which is inverted before it is output via the LLP pin, so the LLP pin is active high.

So, if any of the following conditions is true, the laser write power is disabled by the MACE2 servo.

- Off Track, more than a quarter off a track away from the correct one
- ORD, radial error signal too large. Larger than the given setpoint, which should be chosen at a critical write failure level. An adjustable band pass filter first processes the radial error signal.
- OFD, focus error signal too large. Larger than the given setpoint, which should also be chosen with care. An adjustable band pass filter also first processes the focus error signal. All settings of the focus and radial part are independent.
- OTR, prot stat flag which becomes active if ORD becomes active during an actual laser write (LWR) action. This flag is reset only by a status read (RSTAT) command. So until then LLPN stays active.
- OFO, prot stat flag that becomes active if OFD becomes active during an actual laser write action. Same idea as OTR.

This error detection circuit can be switched off (apart from the Off Track detection) by raising the setpoint levels to its maximum value.

9.15 The OPC.

The OPC block in Mace2 is used for the following functions:

- During write actions, it stores Pw samples, which can be evaluated by the microprocessor.
- During OPC read actions, it stores A1, A2 and CALF samples, which are used for calculating the asymmetry and the modulation index.
- The OPC block is used for EFM detection.
- During reading of a disc, it stores A1 and CALF samples, which can be monitored.

Although the OPC block is used for multiple functions, it got its name from the OPC procedure, which is its main task. The OPC (Optimum Power Calibration) procedure is used in CD-R/CD-RW/DVD-RAM applications. It is used to "calibrate" the laser write power in writable systems. It reads in 3 analogue signals from an analogue pre-processor like AEGER-2 (A1, A2, and CALF) and the actual write power (Pw) from the laser controller and feeds an analogue output signal Alpha0 back to AEGER-2. A1, A2 and CALF represent the max, min and average value of the EFM signal respectively. Alpha0 controls the laser write power. All analogue signals are converted to an 8 bit digital signal. Conversion frequency at 16.9MHz base clock is 88kHz (each channel).

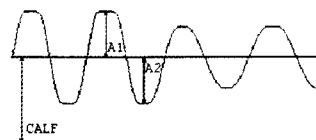


Figure 9-4 Definition of the A1, A2 and CALF signals.

9.16 Definition of terms.

The asymmetry (and modulation index m of the EFM signal are calculated from the analogue inputs:

$$\beta = \frac{A1 - A2}{A1 + A2}$$

$$m = \frac{A1 + A2}{A1 + CALF}$$

9.17 Rough description of the OPC procedure

Basically the OPC procedure tries to find out the optimum laser power to be used on a specific disc. The OPC procedure uses about 15 ATIP frames. These frames are located in the "PCA" area. This is a special part of the disc used only for power calibration. The drive first checks whether there are 15 frames "empty" in the PCA. Next the OPC is performed in these 15 frames. The OPC operation consists of two stages: A "write" and a "read" stage. First 15 ATIP frames are written (during which the OPC block stores Pw samples), and then the same 15 ATIP frames are read back again, (during which the OPC block stores A1, A2 and CALF samples). During the write stage, random EFMis written in a test area located on the inner side of the disc. During this recording the write power is increased stepwise from a low to a high power level.

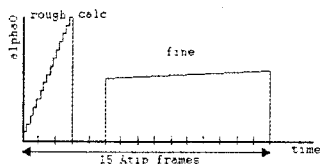


Figure 9-5 Figure 5: OPC write profile.

First during 15 Atip frames the power is increased in rather big steps (rough OPC). During this action Pw samples are stored into memory. During the rough OPC, the OPC makes 7 steps per ATIP frame. This gives 21 samples into the OPC memory. From these samples, the microprocessor can calculate what's roughly the best alpha0 setting for this typical disc.

After 2 frames of calculations, another 10 ATIP frames are written using smaller steps (fine OPC) around the alpha0 setting, which gave the best result during the rough OPC. The second stage of the OPC procedure is the "read" phase

in which the pattern recorded in the previous stage is read back.

During this read phase the OPC block stores A1, A2 and CALF samples from exact the same location where during the OPC write phase the Pw samples were stored. The samples for A1, A2, CALF and Pw are listed side by side into memory. After the read back phase the processor calculates at which setting of alpha0 the least jitter is encountered. This setting will be used to write the disc with.

9.18 The OPC top level.

The OPC block as a whole has 5 possible modes:

- Recording mode: This can be either OPC writing (writing EFM test patterns to disc and Alpha0 stepping) or standard write mode (i.e. alpha0 is constant).
- OPC reading: Reading back OPC test patterns from disc.
- Normal read mode: detects the presence of EFM.
- DVD read mode: used for DVD-RAM experiments.
- EFMD only mode: no data being written to the AUX RAM, but the EFM detector and the Pw monitor still running. Contents of the QUX RAM remain unchanged.

All actions in the OPC hardware are synchronised to the ATIP frame sync, which can be either generated internally or received from the encoder/decoder during writing. The microprocessor writes data asynchronously to the OPC hardware. The OPC block synchronises this data to the sync either internally generated, or obtained from CDR60.

9.19 The Analogue to Digital converter.

The analogue to digital converter of the OPC is shared with the ADC required by the PCS.

9.20 The digital input filters.

The combined ADC for the OPC and the PCS delivers a multiplexed stream of 8 bit words. A sequential low-pass filter filters this multiplexed stream. The 4 analogue multiplexed input signals from the OPC (A1, A2, CALF and Pw) are filtered by 4 identical LPF's. (One for each channel). This filters can be adapted to various speeds by changing the subsampling factor (i.e. the sample rate of the filter), the cut off frequency scales with the sample frequency. The sample frequency of the filter is equivalent to the OPC timebase frequency, which is the output of the pre-scaler.

9.21 OPC demux.

The OPC demux block demultiplexes the stream supplied by the LPF. This same block also changes the format of the digital data from signed (representation inside the filter) to unsigned (representation in the rest of the OPC). The demultiplexing process introduces one baseclock delay.

9.22 The sequencer.

The OPC sequencer controls the timing of all the hardware actions in the OPC hardware. It generates the OPC timebase and locks it to the ATIP pulse. A programmable pre-scaler generates the OPC timebase.

Dividing the ADC sample clock by 8 derives the input clock of this pre-scaler. (= identical to the sample rate per channel). The pre-scaler can divide this clock by a number in the range from 1-16. The division factor can be programmed via the OPC ctrl register. The OPC timebase is locked to the selected ATIP source, which can be either an external ATIP sync or an internally generated sync. (Programmable). The OPC timebase clock supplies the sample frequency for

the input LPF's, the OPC pre-processor and the EFM detector.

The sequencer controls the timing of all the hardware actions in the OPC hardware. The sequencer is started either by an external ATIP sync or an internally generated sync (programmable).

All data acquisition and alpha0 settings change synchronised to this sync signal (rising edge of the ATIP sync). An exception on this is the switching of the ATIP input itself, which is immediately changed whenever the bit in the OPC ctrl register is changed. When this was latched on the ATIP source itself, it would create a deadlock when there was no ATIPin from CDR-60.

9.23 The Pw monitor

The Pw monitor is used during the "OPC write" and normal write mode. The comparator compares the incoming Pw with two programmable thresholds PW MAX and PW MIN. Both these thresholds can be programmed via the OPC PW register, which contains 4 bits for each threshold. Internally both 4-bit thresholds PW MAX and PW MIN are extended to 8 bit values. The compare function performs an unsigned compare.

The first threshold is used to detect fingerprints. The second is used to check the correct operation of the laser driver.

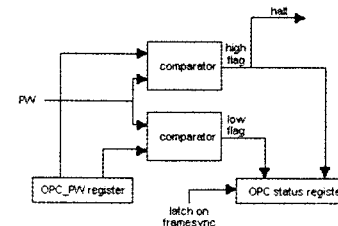


Figure 9-6 OPC PW monitor.

DVDALAS2plus Advanced Analogue DVD Signal Processor and Laser Supply

TZA1033

FEATURES

- Operates with DVD-ROM, DVD-RAM, DVD-RW, DVD-RW, CD-ROM and CD-RW media
- Operates up to 64x CD-ROM and 8x DVD-ROM
- Support for Dual Light pen DVD systems (DVD/CDRW)
- DVD-RAM (C) playback capability
- DVD-RAM Land-Groove servo polarity switching
- 3 different tracking servo strategies:
Conventional 3 beam tracking for CD;
Differential Phase Detection (DPD) for DVD;
(including option to emulate traditional drop out detection; drop out concealment)
Advanced Push Pull with dynamic offset compensation for DVD-RAM (recorded and unrecorded areas)
- Radial error signal for fast track counting (FTC)
- 2 different strategies to read header data:
- Full bandwidth Push Pull signal
- Left and Right side signal
- Universal photo diode IC interface using internal conversion resistors and offset cancelation
- Flexible adaption to different light pen configurations
- Input buffer amplifiers with low-pass filtering
- RF data amplifier with wide (programmable) bandwidth equivalent to 64xCD / 8x DVD when using equaliser function
- Built-in equalisers cover CAV inner-outer disc range at highest speed.
- Programmable RF gain for DVD-ROM / DVD-RAM / CD-RW / CDRW applications (approx 50dB range)
- Balanced RF-Data signal transfer (single ended still supported)
- Fully automatic laser control including stabilization and an ON/OFF switch, plus a separate supply pin for power efficiency
- Automatic monitor diode polarity selection.
- 3 and 5 V compatible digital interface
- Enhanced signal conditioning in DPD circuit for optimal tracking performance under noisy conditions.

GENERAL DESCRIPTION

The DVDALAS2 is an analogue preprocessor and laser supply circuit for DVD / CD read only players. The device contains data amplifiers, several options for radial tracking and focus control. The preamplifier forms a versatile, programmable interface between dual, voltage output CD/DVD mechanisms to Philips' digital signal processor family for CD and DVD (Gecko, HDR65, Iguano, etc..)

The device contains several options for radial tracking: Conventional 3 beam tracking for CD; Differential Phase Detector (DPD) for DVD; Push Pull for DVD-RAM with flexible L/R weighing to compensate dynamic offsets e.g. beamlanding offset. A radial error signal is generated to allow fast track count (FTC) during track jumps.

The dynamic range of this preamp/processor combination can be optimized for the LF servo and RF data paths. The gain in both channels can be programmed separately. This will guarantee an optimal playability for all kind of discs.

Several functions are included to allow playback of DVD-RAM(C) discs:

- The header information can be read via the data output path (RF)
- DC offset compensation techniques provide a fast settling after disc errors.
- Radial servo Polarity switch for land/groove
- two settings for focus offset correction for land and groove

The device can accommodate astigmatic, single focault and double focault detectors and can be used with P-type lasers with N- or P-sub monitor diodes. After an initial adjustment, the circuit will maintain control over the laser diode current. With an on-chip reference voltage generator, a constant and stabilized output power is ensured independent of ageing. A separate power supply connection allows the internal power dissipation to be reduced by connecting a low voltage supply.

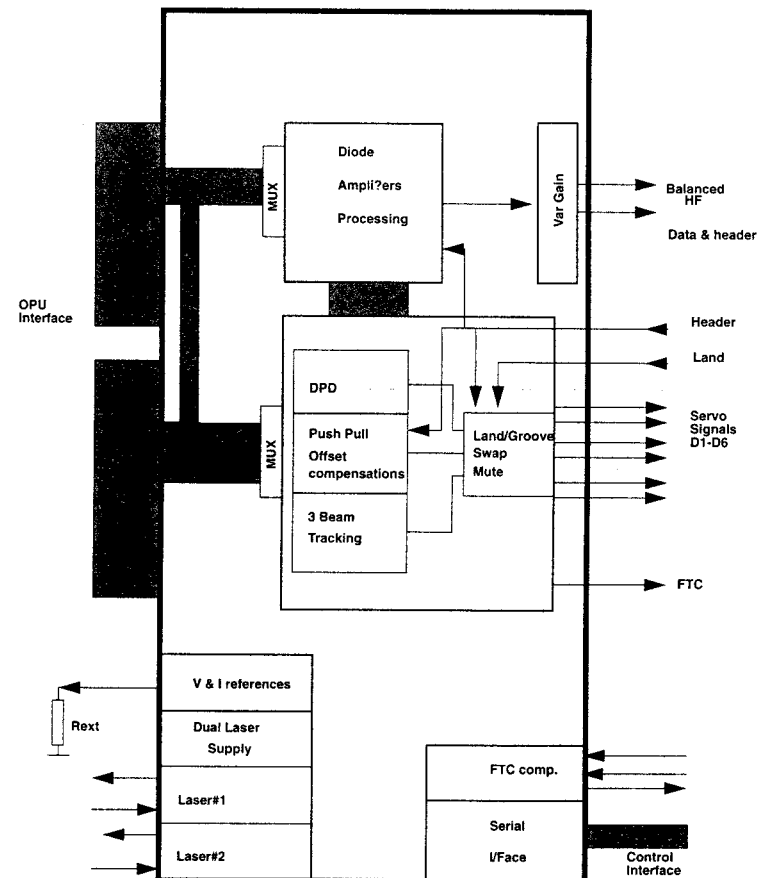
ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
TZA1023	LOFP64	Plastic low profile QFP64; body 10 x 10 x 1.4 mm	SOT314-2

DVDALAS2plus Advanced Analogue DVD Signal Processor and Laser Supply

TZA1033

DEVICE BLOCK DIAGRAM



DVDALAS2plus Advanced Analogue DVD
Signal Processor and Laser Supply

TZA1033

PINNING

Name	Pin	Description
CD-A	1	CD pick up input A
CD-B	2	CD pick up input B
CD-C	3	CD pick up input C
CD-D	4	CD pick up input D
CD-REF	5	CD pick up reference voltage
CD-E	6	CD pick up input E
CD-F	7	CD pick up input F
DVD-A	12	DVD pick up input A
DVD-B	13	DVD pick up input B
DVD-C	14	DVD pick up input C
DVD-D	15	DVD pick up input D
DVD-ref	16	DVD pick up reference voltage
O-A	48	Servo current output for Focus-A
O-B	47	Servo current output for Focus-B
O-C	46	Servo current output for Focus-C
O-D	45	Servo current output for Focus-D
O-central	40	Testpin for offset cancelation
TD2	37	Internally connected
FTC-ref	36	Servo output voltage reference input
S1	42	Servo current output for radial tracking
S2	41	Servo current output for radial tracking
TD1	35	Internally connected
FTC	33	Fast track count voltage output
RFP	55	pos. RF output signal
RFN	56	neg. RF output signal
RF-REF	54	DC Reference signal input RF
LPF-DPD1	38	DPD Low pass bandwidth capacitor, channel pos
LPF-DPD2	39	DPD Low passbandwidth capacitor, channel neg
Land	20	Land/groove toggle input
HEADER	21	Header detector window input
CD-MI	62	CD laser monitor input
DVD-MI	10	DVD laser monitor input
CD-LO	61	CD laser output
DVD-LO	64	DVD laser output
COP	27	Positive inputFTC comparator
COM	28	Inverting inputFTC comparator
COO	29	FTC comparator output

DVDALAS2plus Advanced Analogue DVD
Signal Processor and Laser Supply

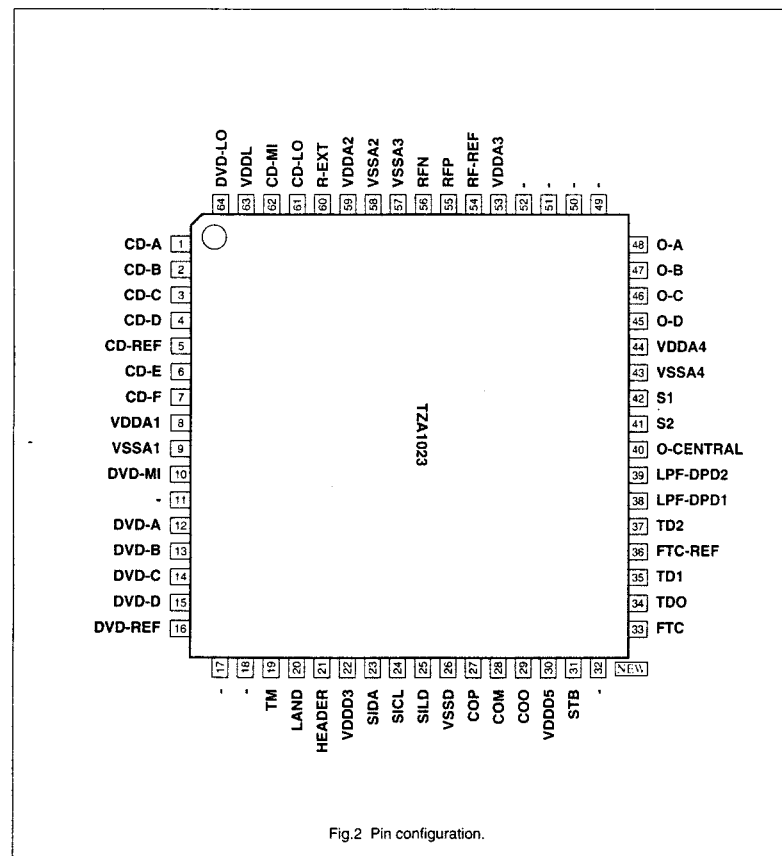
TZA1033

Name	Pin	Description
SIDA	23	Serial host interface data input
SICL	24	Serial host interface clock input
SILD	25	Serial host interface load
VDDA1	8	Analog Supply voltage 1 (RF input)
VDDA2	59	Analog Supply voltage 2 (RF internal)
VDDA3	53	Analog Supply voltage 3 (RF output stage)
VDDA4	44	Analog Supply voltage 4 (Servo)
VDDD5	30	Digital Supply voltage (5V dig core)
VDDD3	22	Digital Supply voltage (3V I/O pads and FTC comp.)
VDDL	63	Supply voltage for laser
VSSA1	9	Analog Ground 1
VSSA2	58	Analog Ground 2
VSSA3	57	Analog Ground 3
VSSA4	43	Analog Ground 4
VSSD	26	Digital ground
Rext	60	Reference current input (Connect 12k1 to VSSA4)
STB	31	Standby input
TM	19	Testmode input
TDO	34	test data out

DVDALAS2plus Advanced Analogue DVD
Signal Processor and Laser Supply

TZA1033

PINNING

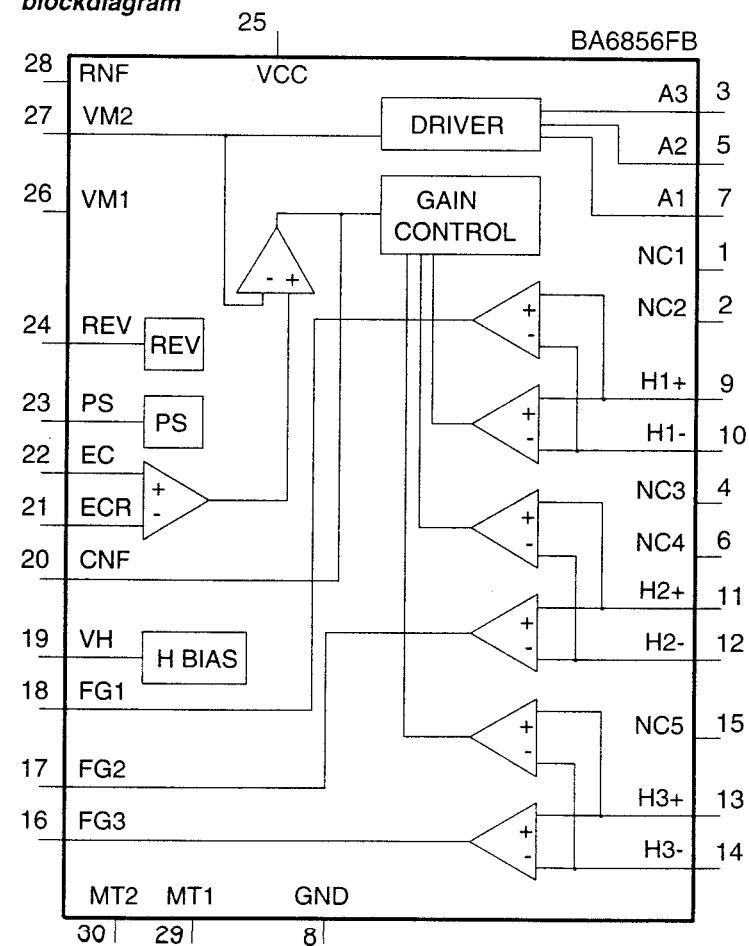


BA6856FP: 3 PHASE MOTOR DRIVER FOR DVD PLAYERS

Features

- 1/3-phase, full-wave pseudo linear driving system
- built-in power save
- built-in thermal shut down circuit
- built-in current limit circuit
- built in Hall bias circuit
- built in FG-output (3-phase parallel output)
- with switching function of regular/ reverse rotations

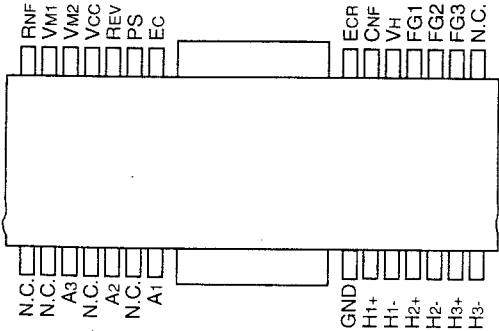
blockdiagram



pin description

PIN No	PIN NAME	DESCRIPTION
1	N.C.	Not connected
2	N.C.	Not connected
3	A ₃	Output 3 for motor
4	N.C.	Not connected
5	A ₂	Output 2 for motor
6	N.C.	Not connected
7	A ₁	Output 1 for motor
8	GND	Ground
9	H ₁ ⁺	Hall input Amp1. positive input
10	H ₁ ⁻	Hall input Amp1. negative input
11	H ₂ ⁺	Hall input Amp2. positive input
12	H ₂ ⁻	Hall input Amp2. negative input
13	H ₃ ⁺	Hall input Amp3. positive input
14	H ₃ ⁻	Hall input Amp3. negative input
15	N.C.	Not connected
16	FG3	FG3 signal output terminal
17	FG2	FG2 signal output terminal
18	FG1	FG1 signal output terminal
19	V _H	Hall Bias
20	C _{NE}	Capacitor connection pin for phase compensation
21	E _{CR}	Torque control standard voltage input terminal
22	E _C	Torque control voltage input terminal
23	PS	POWER SAVE switch
24	R _{EV}	Reverse terminal
25	V _{CC}	Power supply for sinal division
26	V _{M2}	Power supply 2 for driver
27	V _{M1}	Power supply 2 for driver
28	R _{NE}	Power supply for driver division
FIN	FIN	GND

Terminal lay-out



DSP for CD and DVD-ROM systems

SAA7335

FEATURES

- Compatibility with CD-I, CD-ROM, MPEG-video DVD-ROM and DVD-video applications
- Designed for very high playback speeds
- Typical CD-ROM operation up to n = 12, DVD-ROM to n = 1.9, maximum rates (tbf)
- Matched filtering, quad-pass error correction (C1-C2-C1-C2), overspeed audio playback function included (up to 3 kbytes buffer)
- Lock-to-disc playback, Constant Angular Velocity (CAV), pseudo-Constant Linear Velocity (CLV) and CLV motor control loops
- Interface to 32 kbytes SRAM for DVD error correction and de-interleave
- Sub-code/ header processing for DVD and CD formats
- Programmable HF equalizer
- In DVD mode it is still compatible with Philips block decoders
- Sub-CPU interface can be parallel or fast I²C-bus
- On-chip clock multiplier.



In DVD modes double-pass C1-C2 error correction is used which is capable of correcting up to 5 C1 frame errors and 16 C2 frame errors.

The SAA7335 contains all the functions required to decode an EFM or EFM+ HF signal directly from the laser pre-amplifier, including analog front-end, PLL data recovery, demodulation and error correction. The spindle motor interface provides both motor control signals from the demodulator and, in addition, contains a tachometer loop that accepts tachometer pulses from the motor unit.

The SAA7335 has two independent microcontroller interfaces. The first is a serial I²C-bus and the second is a standard 8-bit multiplexed parallel interface. Both of these interfaces provide access to a total of 32 × 8-bit registers for control and status.

This data sheet contains an descriptive overview of the device together with electrical and timing characteristics. For a detailed description of the device refer to the user guide "SAU/UM96018".

Supply of this CD/DVD IC does not convey an implied license under any patent right to use this IC in any CD or DVD application.

GENERAL DESCRIPTION

This device is a high-end combined Compact Disc (CD) and Digital Versatile Disc (DVD) compatible decoding device. The device operates with an external 32 kbytes S-RAM memory for de-interleaving operations. The device provides quad-pass error correction for CD-ROM applications (C1-C2-C1-C2) and operates in lock-to-disk, CAV, pseudo CLV and CLV modes.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
V _{DD}	digital supply voltage	4.5	5.0	5.5	V
I _{DD}	digital supply current	—	70	300	mA
V _{DDA}	analog supply voltage	4.5	5.0	5.5	V
I _{DDA}	analog supply current	—	70	300	mA
f _{xtal}	crystal input frequency	4	25	tbf	MHz
T _{amb}	operating ambient temperature	−20	—	+70	°C
T _{stg}	storage temperature	−55	—	+125	°C

DSP for CD and DVD-ROM systems

SAA7335

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
SAA7335GP	LQFP100	plastic low profile quad flat package; 100 leads; body 14 × 14 × 1.4 mm	SOT407-1

BLOCK DIAGRAM

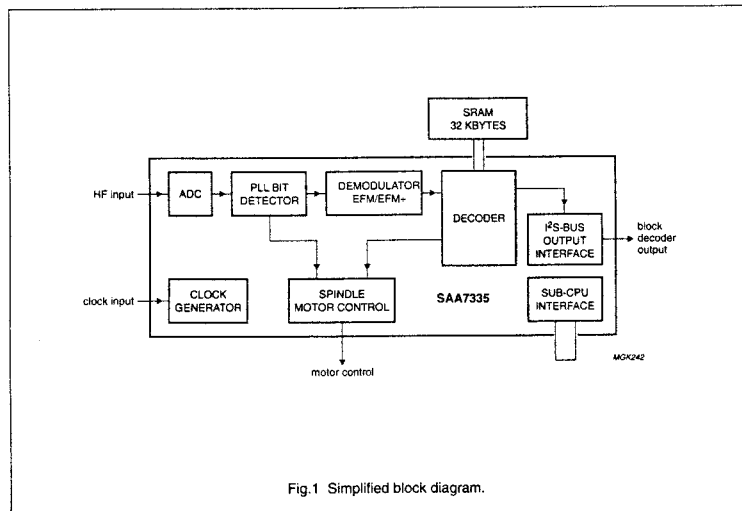


Fig.1 Simplified block diagram.

DSP for CD and DVD-ROM systems

SAA7335

PINNING

SYMBOL	PIN	TYPE	DESCRIPTION
V _{SSA1}	1	supply	analog ground 1
I _{ref}	2	I	analog current reference input for ADC
REFL ₀	3	I	analog low reference input for ADC
REFH _i	4	I	analog high reference input for ADC
VREF	5	I	analog negative input
HFIN	6	I	analog positive input
V _{SSA2}	7	supply	analog ground 2
AGCOUT	8	O	analog test pin output
V _{DDA2}	9	supply	analog supply voltage 2
V _{DD01}	10	supply	digital supply voltage 1
V _{SS01}	11	supply	digital ground 1
OTD	12	I	off track detect input
MOTO1	13	O	3-state motor control output
n.c.	14	—	not connected, reserved
MOTO2/T3	15	I/O	motor control output/tachometer 3 input
n.c.	16	—	not connected, reserved
T1	17	I	tachometer 1 input
T2	18	I	tachometer 2 input
V _{DD02}	19	supply	digital supply voltage 2
V _{SS02}	20	supply	digital ground 2
TEST1	21	I	test input 1
TEST2	22	I	test input 2
POR	23	I	power-on reset input
MUXSWICH	24	I	use clock multiplier input
n.c.	25	—	not connected, reserved
CL1	26	O	divided clock output
BCAIN	27	I	BCA input
SDA	28	I/O	sub-CPU I²C-bus serial data input/output
SCL	29	I	sub-CPU I²C-bus serial clock input
INT	30	O	sub-CPU interrupt output (open-drain)
V _{DD03}	31	supply	digital supply voltage 3
V _{SS03}	32	supply	digital ground 3
da7	33	I/O	sub-CPU data bus bit 7 input/output (parallel)
da6	34	I/O	sub-CPU data bus bit 6 input/output (parallel)
da5	35	I/O	sub-CPU data bus bit 5 input/output (parallel)
n.c.	36	—	not connected, reserved
da4	37	I/O	sub-CPU data bus bit 4 input/output (parallel)
n.c.	38	—	not connected, reserved
da3	39	I/O	sub-CPU data bus bit 3 input/output (parallel)
da2	40	I/O	sub-CPU data bus bit 2 input/output (parallel)

DSP for CD and DVD-ROM systems

SAA7335

SYMBOL	PIN	TYPE	DESCRIPTION
da1	41	I/O	sub-CPU data bus bit 1 input/output (parallel)
n.c.	42	–	not connected, reserved
da0	43	I/O	sub-CPU data bus bit 0 input/output (parallel)
V _{DD4}	44	supply	digital supply voltage 4
V _{SS4}	45	supply	digital ground 4
WRi	46	I	sub-CPU write enable input (active LOW)
RD _i	47	I	sub-CPU read enable input (active LOW)
ALE	48	I	sub-CPU address latch enable input
CSi	49	I	sub-CPU chip select input (active HIGH)
STOPCLOCK	50	O	stop clock output
n.c.	51	–	not connected, reserved
V4	52	O	serial subcode output (for CD)
EBUOUT	53	O	digital audio output
SYNC	54	O	I ² S-bus sector sync output
FLAG	55	O	I ² S-bus correction ?ag output
DATA	56	O	I ² S-bus serial data output
BCLK	57	I/O	I ² S-bus bit serial clock input/output
WCLK	58	I/O	I ² S-bus word clock input/output
V _{DD5}	59	supply	digital supply voltage 5
V _{SS5}	60	supply	digital ground 5
RAMRW	61	O	RAM read/write control output
n.c.	62	–	not connected, reserved
RAMDA7	63	I/O	RAM data bus bit 7 input/output
RAMDA6	64	I/O	RAM data bus bit 6 input/output
RAMDA5	65	I/O	RAM data bus bit 5 input/output
RAMDA4	66	I/O	RAM data bus bit 4 input/output
RAMDA3	67	I/O	RAM data bus bit 3 input/output
RAMDA2	68	I/O	RAM data bus bit 2 input/output
n.c.	69	–	not connected, reserved
RAMDA1	70	I/O	RAM data bus bit 1 input/output
RAMDA0	71	I/O	RAM data bus bit 0 input/output
V _{DD6}	72	supply	digital supply voltage 6
V _{SS6}	73	supply	digital ground 6
RAMAD0	74	O	RAM address bit 0 output
RAMAD1	75	O	RAM address bit 1 output
RAMAD2	76	O	RAM address bit 2 output
RAMAD3	77	O	RAM address bit 3 output
RAMAD4	78	O	RAM address bit 4 output
RAMAD5	79	O	RAM address bit 5 output
RAMAD6	80	O	RAM address bit 6 output
V _{DD7}	81	supply	digital supply voltage 7

DSP for CD and DVD-ROM systems

SAA7335

SYMBOL	PIN	TYPE	DESCRIPTION
V _{SS7}	82	supply	digital ground 7
RAMAD7	83	O	RAM address bit 7 output
RAMAD8	84	O	RAM address bit 8 output
RAMAD9	85	O	RAM address bit 9 output
n.c.	86	–	not connected, reserved
RAMAD10	87	O	RAM address bit 10 output
RAMAD11	88	O	RAM address bit 11 output
RAMAD12	89	O	RAM address bit 12 output
RAMAD13	90	O	RAM address bit 13 output
RAMAD14	91	O	RAM address bit 14 output
V _{DD8}	92	supply	digital supply voltage 8
V _{SS8}	93	supply	digital ground 8
CRIN	94	I	analog crystal input
CROUT	95	O	analog crystal output
CFLG	96	O	correction statistics output
MEAS1	97	O	front-end telemetry output
V _{DD9}	98	supply	digital supply voltage 9
V _{SS9}	99	supply	digital ground 9
V _{DDA1}	100	supply	analog supply voltage 1

SAA7335

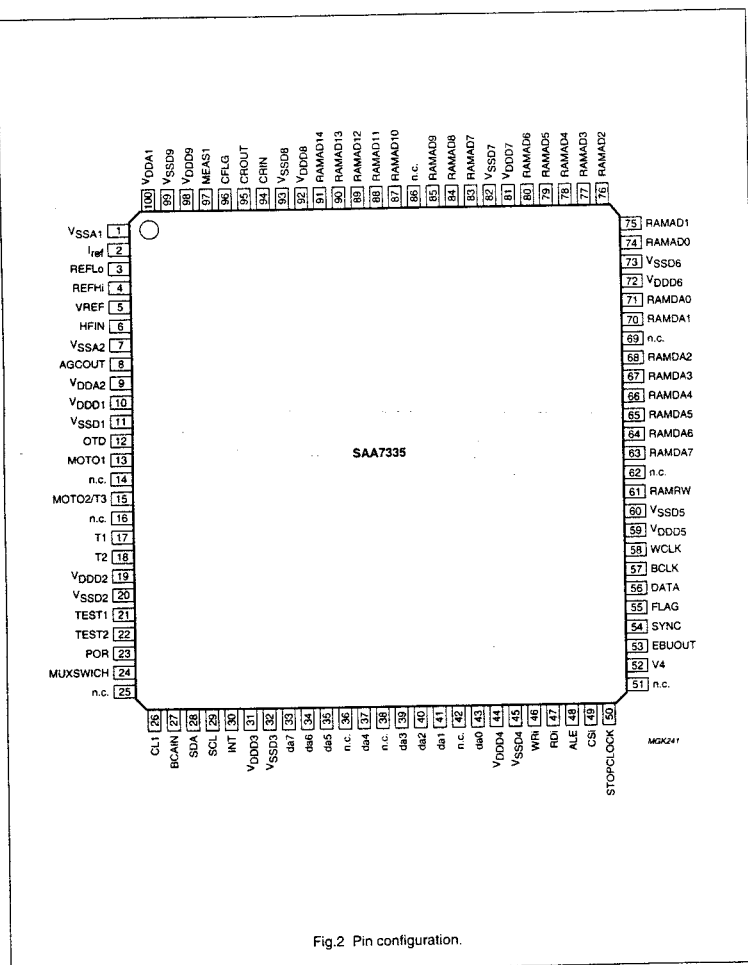


Fig.2 Pin configuration.

SAA7335

Analog front-end

This block converts the HF input to the digital domain using an 8-bit ADC preceded by an AGC circuit to obtain the optimum performance from the converter. This block is clocked by ADCCLK which is set by the external crystal frequency plus a flexible clock multiplier and divider block.

This subsystem recovers the data from the channel stream. The block corrects asymmetry, performs noise filtering and equalisation and finally recovers the bit clock and data from the channel using a digital PLL.

The equalizer and the data slicer are programmable.

Digital logic

All the digital system logic is clocked from the master ADC clock (ADCCLK) described above.

Advanced bit detector

The advanced bit detector offers improved data recovery for multi-layer discs and contains two extra detection circuits to increase the margins in the bit recovery block:

1. Adaptive slicer: adds a second stage slicer with higher bandwidth
2. Run length 2 push-back: all T2 run lengths are pushed back to T3, thereby automatically determining the erroneous edge and shifting the transitions on that edge.

Demodulator

FRAME SYNC PROTECTION CD MODE

This circuit detects the frame synchronization signals.
Two synchronization counters are used in the SAA7335:

1. The coincidence counter: this is used to detect the coincidence of successive syncs. It generates a sync coincidence signal if 2 syncs are 588 ± 1 EFM clocks apart.
2. The main counter: this is used to partition the EFM signal into 17-bit words. This counter is reset when:
 - a) A sync coincidence is generated
 - b) A sync is found within ± 6 EFM clocks of its expected position.

The sync coincidence signal is also used to generate the lock signal which will go active HIGH when 1 sync coincidence is found. It will reset to LOW when, during 61 consecutive frames, no sync coincidence is found.

FRAME SYNC PROTECTION DVD MODE

This circuit detects the frame synchronization signals.
Two synchronization counters are used in the SAA7335:

1. The coincidence counter: this is used to detect the coincidence of successive syncs. It generates a sync coincidence signal if 2 syncs are 1488 ± 3 EFM+ clocks apart.
2. The main counter: this is used to partition the EFM+ signal into 16-bit words. This counter is reset when:
 - a) A sync coincidence is generated
 - b) A sync is found within ± 10 EFM+ clocks of its expected position.

The sync coincidence signal is also used to generate the lock signal which will go active HIGH when 1 sync coincidence is found. It will reset to LOW when, during 61 consecutive frames, no sync coincidence is found.

EFM/EFM+ demodulation

The 14-bit EFM (16-bit EFM+) data and subcode words are decoded into 8-bit symbols.

DSP for CD and DVD-ROM systems

SAA7335

Microcontroller interface

The SAA7335 has two microcontroller interfaces, one serial I²C-bus and one parallel (8051 microcontroller compatible).

The two communication modes may be operated at the same time, the modes are described below:

1. Parallel mode: protocol compatible with 8052 multiplexed bus:
 - a) da0 to da7 = address/data bus
 - b) ALE = Address Latch Enable, latches the address information on the bus
 - c) $\overline{WRi}$ = active LOW write signal for write to SAA7335
 - d) $\overline{RDi}$ = active LOW read signal for read from SAA7335
 - e) $\overline{CSi}$ = active HIGH Chip Select signal (this signal gates the $\overline{RDi}$ and $\overline{WRi}$ signals).
2. I²C-bus mode: I²C-bus protocol where SAA7335 behaves as slave device where:
 - a) SDA = I²C-bus data
 - b) SCL = I²C-bus clock
 - c) I²C-bus slave address (write mode) = 3EH
 - d) I²C-bus slave address (read mode) = 3FH
 - e) Maximum data transfer rate = 400 kbits/s.

MICROCONTROLLER INTERFACE (I²C-BUS MODE)

Bytes are transferred over the interface in single bytes of which there are two types; write data commands and read data commands.

The sequence for a write data command (1 data byte) is as follows:

- Send START condition
- Send address 3EH (write)
- Write command address byte
- Write data byte
- Send STOP condition.

The sequence for a read data command (that reads 1 data byte) is as follows:

- Send START condition
- Send address 3EH (write)
- Write status address byte
- Send STOP condition
- Send START condition
- Send address 3FH (read)
- Read data byte
- Send STOP condition.

READING AND WRITING DATA TO THE SAA7335

The SAA7335 has 32 x 8-bit configuration and status registers as shown in Table 1. Not all locations are currently defined and some remain reserved for future upgrades. These can be written to or read from via the microcontroller interface using either the serial or parallel control bus.

Am29LV160BT/Am29LV160BB

16 Megabit (2 M x 8-Bit/1 M x 16-Bit)
CMOS 3.0 Volt-only Sector Erase Flash Memory

DISTINCTIVE CHARACTERISTICS

- **Single power supply operation**
 - Full voltage range: 2.7 to 3.6 volt read and write operations for battery-powered applications
 - Regulated voltage range: 3.0 to 3.6 volt read and write operations and for compatibility with high performance 3.3 volt microprocessors
- **Manufactured on 0.35 μ m process technology**
- **Supports Common Flash Memory Interface (CFI)**
- **High performance**
 - Full voltage range: access times as fast as 90 ns
 - Regulated voltage range: access times as fast as 80 ns
- **Ultra low power consumption (typical values at 5 MHz)**
 - 200 nA Automatic Sleep mode current
 - 200 nA standby mode current
 - 10 mA read current
 - 20 mA program/erase current
- **Flexible sector architecture**
 - One 16 Kbyte, two 8 Kbyte, one 32 Kbyte, and thirty-one 64 Kbyte sectors (byte mode)
 - One 8 Kword, two 4 Kword, one 16 Kword, and thirty-one 32 Kword sectors (word mode)
 - Supports full chip erase
 - Sector Protection features:
 - A hardware method of locking a sector to prevent any program or erase operations within that sector
 - Sectors can be locked in-system or via programming equipment
 - Temporary Sector Unprotect feature allows code changes in previously locked sectors
- **Top or bottom boot block configurations available**
- **Embedded Algorithms**
 - Embedded Erase algorithm automatically preprograms and erases the entire chip or any combination of designated sectors
 - Embedded Program algorithm automatically writes and verifies data at specified addresses
- **Minimum 100,000 write cycle guarantee per sector**
- **Package option**
 - 48-ball FBGA
 - 48-ball μ BGA
 - 48-pin TSOP
 - 44-pin SO
- **Compatibility with JEDEC standards**
 - Pinout and software compatible with single-power supply Flash
 - Superior inadvertent write protection
- **Data# Polling and toggle bits**
 - Provides a software method of detecting program or erase operation completion
- **Ready/Busy# pin (RY/BY#)**
 - Provides a hardware method of detecting program or erase cycle completion (not available on 44-pin SO)
- **Erase Suspend/Erase Resume**
 - Suspends an erase operation to read data from, or program data to, a sector that is not being erased, then resumes the erase operation
- **Hardware reset pin (RESET#)**
 - Hardware method to reset the device to reading array data

GENERAL DESCRIPTION

The Am29LV160B is a 16 Mbit, 3.0 Volt-only Flash memory organized as 2,097,152 bytes or 1,048,576 words. The device is offered in 48-ball FBGA, 48-ball μ BGA, 44-pin SO, and 48-pin TSOP packages. The word-wide data (x16) appears on DQ15–DQ0; the byte-wide (x8) data appears on DQ7–DQ0. This device is designed to be programmed in-system with the standard system 3.0 volt V_{CC} supply. A 12.0 V V_{PP} or 5.0 V_{CC} are not required for write or erase operations. The device can also be programmed in standard EPROM programmers.

The device offers access times of 80, 90, and 120 ns, allowing high speed microprocessors to operate without wait states. To eliminate bus contention the device has separate chip enable (CE#), write enable (WE#) and output enable (OE#) controls.

The device requires only a **single 3.0 volt power supply** for both read and write functions. Internally generated and regulated voltages are provided for the program and erase operations.

The Am29LV160B is entirely command set compatible with the **JEDEC single-power-supply Flash standard**. Commands are written to the command register using standard microprocessor write timings. Register contents serve as input to an internal state-machine that controls the erase and programming circuitry. Write cycles also internally latch addresses and data needed for the programming and erase operations. Reading data out of the device is similar to reading from other Flash or EPROM devices.

Device programming occurs by executing the program command sequence. This initiates the **Embedded Program** algorithm—an internal algorithm that automatically times the program pulse widths and verifies proper cell margin. The **Unlock Bypass** mode facilitates faster programming times by requiring only two write cycles to program data instead of four.

Device erasure occurs by executing the erase command sequence. This initiates the **Embedded Erase** algorithm—an internal algorithm that automatically pre-programs the array (if it is not already programmed) before executing the erase operation. During erase, the device automatically times the erase pulse widths and verifies proper cell margin.

The host system can detect whether a program or erase operation is complete by observing the RY/BY# pin, or by reading the DQ7 (Data# Polling) and DQ6 (toggle) **status bits**. After a program or erase cycle has been completed, the device is ready to read array data or accept another command.

The **sector erase architecture** allows memory sectors to be erased and reprogrammed without affecting the data contents of other sectors. The device is fully erased when shipped from the factory.

Hardware data protection measures include a low V_{CC} detector that automatically inhibits write operations during power transitions. The **hardware sector protection** feature disables both program and erase operations in any combination of the sectors of memory. This can be achieved in-system or via programming equipment.

The **Erase Suspend/Erase Resume** feature enables the user to put erase on hold for any period of time to read data from, or program data to, any sector that is not selected for erasure. True background erase can thus be achieved.

The **hardware RESET#** pin terminates any operation in progress and resets the internal state machine to reading array data. The RESET# pin may be tied to the system reset circuitry. A system reset would thus also reset the device, enabling the system microprocessor to read the boot-up firmware from the Flash memory.

The device offers two power-saving features. When addresses have been stable for a specified amount of time, the device enters the **automatic sleep mode**. The system can also place the device into the **standby mode**. Power consumption is greatly reduced in both these modes.

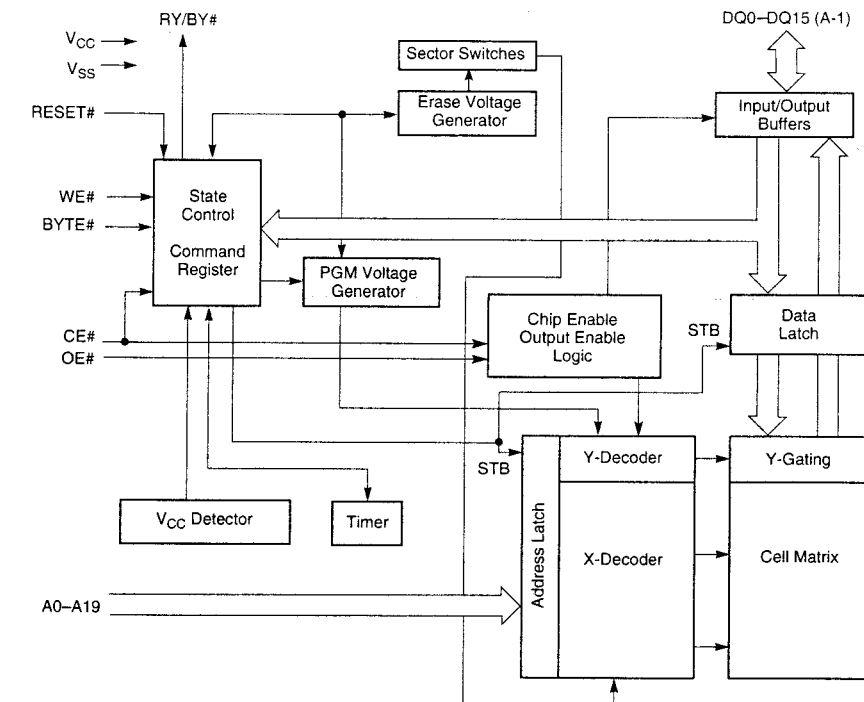
AMD's Flash technology combines years of Flash memory manufacturing experience to produce the highest levels of quality, reliability and cost effectiveness. The device electrically erases all bits within a sector simultaneously via Fowler-Nordheim tunneling. The data is programmed using hot electron injection.

PRODUCT SELECTOR GUIDE

Family Part Number	Am29LV160B		
Ordering Part Number: $V_{CC} = 3.0\text{--}3.6\text{ V}$	80R		
$V_{CC} = 2.7\text{--}3.6\text{ V}$		90	120
Max access time, ns (t_{ACC})	80	90	120
Max CE# access time, ns (t_{CE})	80	90	120
Max OE# access time, ns (t_{OE})	30	35	50

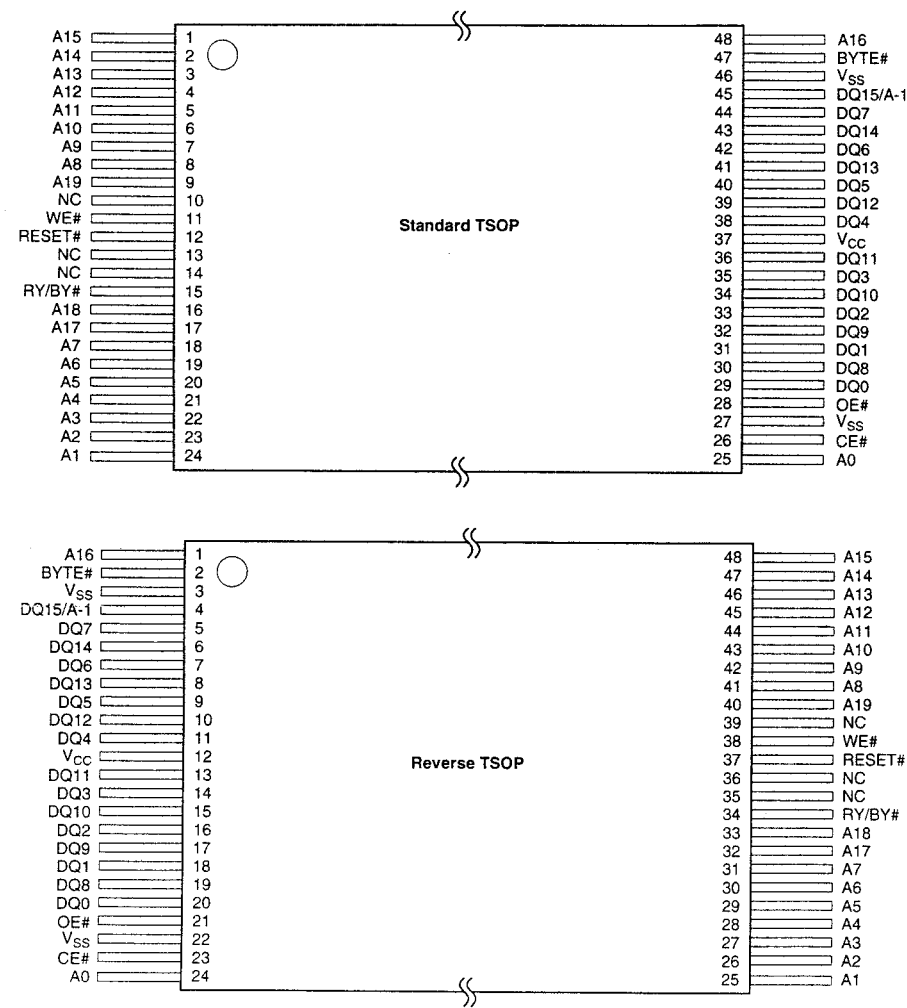
Note: See "AC Characteristics" for full specifications.

BLOCK DIAGRAM



21358C-1

CONNECTION DIAGRAMS



SYNCHRONOUS DRAM

MT48LC1M16A1 S - 512K x 16 x 2 banks

FEATURES

- PC100 functionality
- Fully synchronous; all signals registered on positive edge of system clock
- Internal pipelined operation; column address can be changed every clock cycle
- Internal banks for hiding row access/precharge
1 Meg x 16 - 512K x 16 x 2 banks architecture with 11 row, 8 column addresses per bank
- Programmable burst lengths: 1, 2, 4, 8 or full page
- Auto Precharge Mode, includes CONCURRENT AUTO PRECHARGE
- Self Refresh and Adaptable Auto Refresh Modes
 - 32ms, 2,048-cycle refresh or
 - 64ms, 2,048-cycle refresh or
 - 64ms, 4,096-cycle refresh
- LVTTTL-compatible inputs and outputs
- Single +3.3V ±0.3V power supply
- Supports CAS latency of 1, 2 and 3

OPTIONS

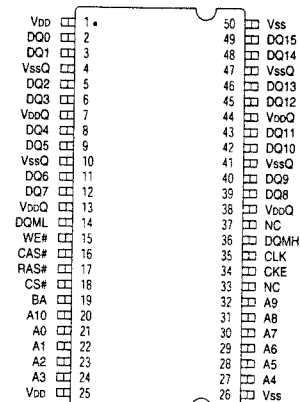
- Configuration
1 Meg x 16 (512K x 16 x 2 banks) 1M16A1
- Plastic Package - OCPL*
50-pin TSOP (400 mil) TG
- Timing (Cycle Time)
 - 6ns (166 MHz) -6
 - 7ns (143 MHz) -7
 - 8ns (125 MHz) -8A
- Refresh
2K or 4K with Self Refresh Mode at 64ms S
- Part Number Example: MT48LC1M16A1TG-7S

KEY TIMING PARAMETERS

SPEED	CLOCK	ACCESS TIME CL = 3**	SETUP	HOLD
-6	166 MHz	5.5ns	2ns	1ns
-7	143 MHz	5.5ns	2ns	1ns
-8A	125 MHz	6ns	2ns	1ns

*Off-center parting line
**CL = CAS (READ) latency

PIN ASSIGNMENT (Top View) 50-Pin TSOP



	1 Meg x 16
Configuration	512K x 16 x 2 banks
Refresh Count	2K or 4K
Row Addressing	2K (A0 A10)
Bank Addressing	2 (BA)
Column Addressing	256 (A0 A7)

16Mb (x16) SDRAM PART NUMBER

PART NUMBER	ARCHITECTURE
MT48LC1M16A1TG S	1 Meg x 16

GENERAL DESCRIPTION

The 16Mb SDRAM is a high-speed CMOS, dynamic random-access memory containing 16,777,216 bits. It is internally configured as a dual 512K x 16 DRAM with a synchronous interface (all signals are registered on the positive edge of the clock signal, CLK). Each of the 512K x 16-bit banks is organized as 2,048 rows by 256 columns by 16 bits. Read and write accesses to the SDRAM are burst oriented; accesses start at a selected location and continue for a programmed number of locations in a programmed

16Mb: x16 SDRAM

16Mb: x16 SDRAM

GENERAL DESCRIPTION (continued)

sequence. Accesses begin with the registration of an ACTIVE command, which is then followed by a READ or WRITE command. The address bits registered coincident with the ACTIVE command are used to select the bank and row to be accessed (BA selects the bank, A0-A10 select the row). The address bits registered coincident with the READ or WRITE command are used to select the starting column location for the burst access.

The SDRAM provides for programmable READ or WRITE burst lengths of 1, 2, 4 or 8 locations, or the full page, with a burst terminate option. An AUTO PRECHARGE function may be enabled to provide a self-timed row precharge that is initiated at the end of the burst sequence.

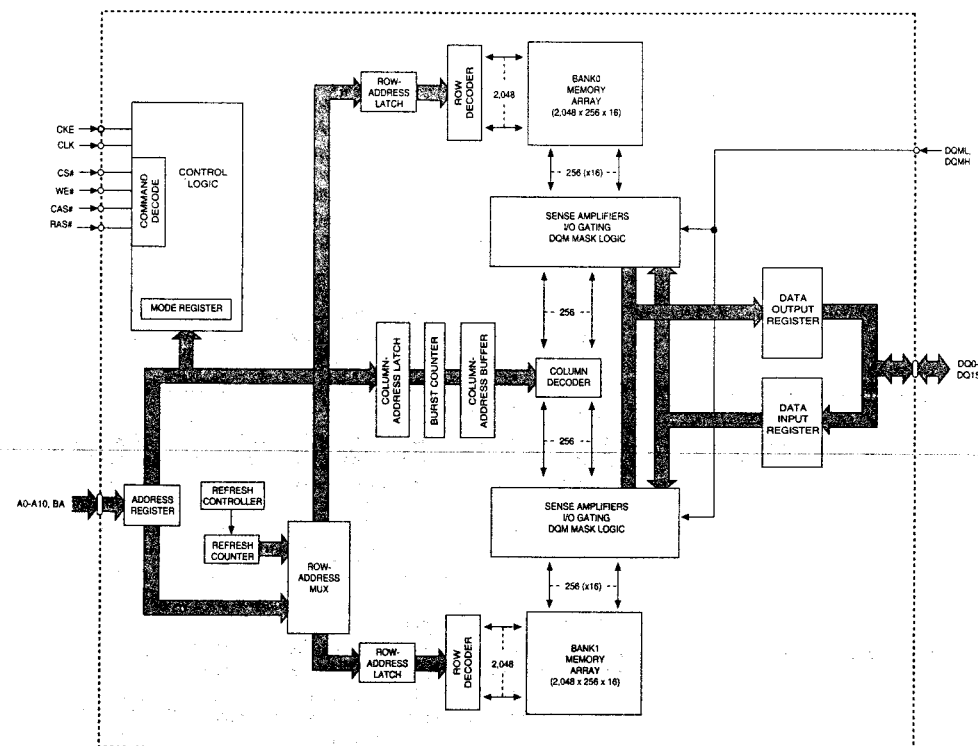
The 1 Meg x 16 SDRAM uses an internal pipelined architecture to achieve high-speed operation. This architecture is compatible with the 2 n rule of prefetch architectures,

but it also allows the column address to be changed on every clock cycle to achieve a high-speed, fully random access. Precharging one bank while accessing the alternate bank will hide the PRECHARGE cycles and provide seamless, high-speed, random-access operation.

The 1 Meg x 16 SDRAM is designed to operate in 3.3V, low-power memory systems. An auto refresh mode is provided, along with a power-saving, power-down mode. All inputs and outputs are LVTTTL-compatible.

SDRAMs offer substantial advances in DRAM operating performance, including the ability to synchronously burst data at a high data rate with automatic column-address generation, the ability to interleave between internal banks in order to hide precharge time, and the capability to randomly change column addresses on each clock cycle during a burst access.

FUNCTIONAL BLOCK DIAGRAM 1 Meg x 16 SDRAM



16Mb: x16
SDRAM

PIN DESCRIPTIONS

PIN NUMBERS	SYMBOL	TYPE	DESCRIPTION
35	CLK	Input	Clock: CLK is driven by the system clock. All SDRAM input signals are sampled on the positive edge of CLK. CLK also increments the internal burst counter and controls the output registers.
34	CKE	Input	Clock Enable: CKE activates (HIGH) and deactivates (LOW) the CLK signal. Deactivating the clock provides PRECHARGE POWER-DOWN and SELF REFRESH operations (all banks idle), ACTIVE POWER-DOWN (row ACTIVE in either bank) or CLOCK SUSPEND operation (burst/access in progress). CKE is synchronous except after the device enters power-down and self refresh modes, where CKE becomes asynchronous until after exiting the same mode. The input buffers, including CLK, are disabled during power-down and self refresh modes, providing low standby power. CKE may be tied HIGH.
18	CS#	Input	Chip Select: CS# enables (registered LOW) and disables (registered HIGH) the command decoder. All commands are masked when CS# is registered HIGH. CS# provides for external bank selection on systems with multiple banks. CS# is considered part of the command code.
15, 16, 17	WE#, CAS#, RAS#	Input	Command Inputs: RAS#, CAS# and WE# (along with CS#) define the command being entered.
14, 36	DQML, DQMH	Input	Input/Output Mask: DQM is an input mask signal for write accesses and an output enable signal for read accesses. Input data is masked when DQM is sampled HIGH during a WRITE cycle. The output buffers are placed in a High-Z state (two-clock latency) when DQM is sampled HIGH during a READ cycle. DQML corresponds to DQ0-DQ7; DQMH corresponds to DQ8-DQ15. DQML and DQMH are considered same state when referenced as DQM.
19	BA	Input	Bank Address Inputs: BA defines to which bank the ACTIVE, READ, WRITE or PRECHARGE command is being applied. BA is also used to program the twelfth bit of the Mode Register.
21-24, 27-32, 20	A0-A10	Input	Address Inputs: A0-A10 are sampled during the ACTIVE command (row-address A0-A10) and READ/WRITE command (column-address A0-A7, with A10 defining AUTO PRECHARGE) to select one location out of the 512K available in the respective bank. A10 is sampled during a PRECHARGE command to determine if all banks are to be precharged (A10 HIGH). The address inputs also provide the op-code during a LOAD MODE REGISTER command.
2, 3, 5, 6, 8, 9, 11, 12, 39, 40, 42, 43, 45, 46, 48, 49	DQ0-DQ15	Input/Output	Data I/Os: Data bus.
33, 37	NC	—	No Connect: These pins should be left unconnected.
7, 13, 38, 44	VDDQ	Supply	DQ Power: Provide isolated power to DQs for improved noise immunity.
4, 10, 41, 47	VSSQ	Supply	DQ Ground: Provide isolated ground to DQs for improved noise immunity.
1, 20	VDD	Supply	Power Supply: +3.3V ±0.3V.
26, 50	VSS	Supply	Ground.

STi5505 (Rev. Ax)

DVD BACKEND DECODER
WITH INTEGRATED HOST PROCESSOR

PRODUCT PREVIEW

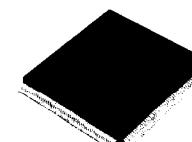
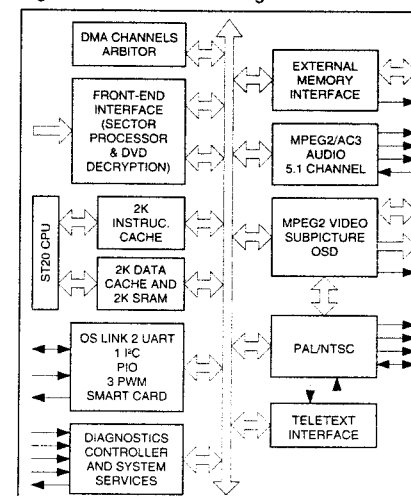
DESCRIPTION

- INTEGRATED 32-BIT RISC HOST CPU
 - 2KBYTES INSTRUCTION CACHE, 2KBYTES DATA CACHE/SRAM
 - 50K DHRYSTONES/SEC (2.1) - 50MHz
- VIDEO DECODER
 - FULLY SUPPORTS MPEG-2 MP@ML
 - MEMORY REDUCTION - PAL IN 12MBITS
- SUBPICTURE DECODER
- HIGH PERFORMANCE ON-SCREEN DISPLAY
- AUDIO DECODER
 - 5.1 CHANNEL DOLBY AC-3® / MULTI CHANNEL MPEG-2 DECODING
 - DOWNMIX TO STEREO OR TO DOLBY PRO-LOGIC COMPATIBLE OUTPUTS FOR MPEG-2 AND AC-3
 - IEC6958 - IEC61937 COMPATIBLE OUTPUT
 - LPCM (DVD) MODE SUPPORTED
 - 6 CHANNELS OUTPUT
- PAL/NTSC ENCODER
 - MACROVISION™ 7.01/6.1 COMPATIBLE
 - TELETEXT, AND CLOSED CAPTION
- HIGH PERFORMANCE SDRAM INTERFACE
- PROGRAMMABLE MEMORY INTERFACE FOR DRAM, ROM, PERIPHERALS ETC.
- FRONT-END CHANNEL IC INTERFACE
 - DVD, VCD AND CD-DA COMPATIBLE
 - DSS - DVB BISTREAMS
 - SERIAL AND PARALLEL INTERFACES
 - HARDWARE SECTOR FILTERING
 - INTEGRATED CSS DECRYPTION AND TRACK BUFFER
- INTEGRATED PERIPHERALS
 - 2 UARTS, 1 I²C CONTROLLER, 3 PWM OUTPUTS, 3 TIMERS, 3 CAPTURE TIMERS, SMART CARD
 - 34 BITS OF PROGRAMMABLE I/O
 - OS LINK
- PROFESSIONAL TOOLSET SUPPORT
 - ANSI C COMPILER AND LIBRARIES
 - OPERATING SYSTEMS SUPPORT
 - ADVANCED DEBUGGING TOOLS
- 208 PIN PQFP PACKAGE

The STi5505 provides a very highly integrated back-end solution for DVD and combo DVD-DVB (Set Top Box) applications. The STi5505 incorporates a host CPU which handles both general application (DVD navigation, CD-DA, VCD, DVB) and drivers of the different embedded peripherals (audio/video, subpicture decoders, OSD, PAL/NTSC encoder...).

The STi5505 offers one of the best cost-effective (memory savings, internal peripherals availability) solution to DVD-DVB applications with rapid time to market (Reference design, DVD-DVB Software Toolkit).

Figure 1 : General Block Diagram

PQFP208 (Plastic Quad Flat Pack)
ORDER CODE : STi5505ACV

STi5505 (Rev. Ax)

I - GENERAL DESCRIPTION

The performance offered by the ST20 CPU and its associated hardware (decoders, encoder, peripherals...) allows an integrated and unified DVD or DVD-DVB software solution.

All the following operations are performed inside the STi5505 :

- application management (DVD Navigation, VCD, CD-DA, DVB-Program Guide ...),
- device data retrieval drivers (demultiplex, stream buffer management ...),
- device presentation drivers (video decoder, subpicture decoder, on-screen display, audio decoder, PAL/NTSC encoder ...),
- embedded peripherals drivers (UART, I²C, Programmable I/O, Smart Card ...).

I.1 - ST20 32-bit CPU

The ST20 micro-core family has been developed by SGS-THOMSON Microelectronics to provide the tools and building blocks to enable the development of highly integrated application-specific 32-bits device at the lowest cost and fastest time to market.

The STi5505 integrates a ST20 C2 core with the following characteristics :

- 50K Dhrystones/s at 50MHz,
- 8/16 bits instructions (32 most common instructions in 8 bits),
- instruction cache 2Kbytes - write back replacement policy,
- internal SRAM 2Kbytes to ensure fast access to critical code, data, interrupt handler ...
- data cache 2 Kbytes - write back replacement policy,

The STi5505's ST20 is provided with advanced debugging tools :

- on-chip real-time emulation,
- debugging with minimal impact on software and performance,
- non intrusive attachment to the host via JTAG (IEEE1149.1),
- no intrusion into the performance of the CPU core,
- no intrusion into user code space by a debug kernel,
- only 40bytes used for breakpoint handler.

I.2 - Video Decoder

The video decoder implemented in the STi5505 uses a patented memory reduction/bandwidth reduction scheme to offer the user the best band-

width/memory size compromise.

The algorithm is lossless and uses "on-the-fly" decoding to reduce the memory requirements to two frame buffers in memory reduction mode.

In this mode, PAL decoding is contained in 12Mbits. When used in bandwidth reduction mode, the memory usage is the normal three buffers but the bandwidth required by the decoder is significantly reduced compared to a classical implementation.

In summary, the features of the decoder are :

- MPEG-2 Main Profile/Main Level (MP@ML) support,
- MPEG-2 program streams, Packet Elementary streams and MPEG-1 system streams support,
- memory reduction architecture allowing sharing of single 16 Mbits SDRAM between MPEG decoding, micro and transport functions - memory expandable to 32 Mbits of SDRAM,
- letter box (16:9) filter,
- pan-scan, horizontal and vertical image resizing,
- automatic error concealment.

I.3 - Subpicture Decoder

The STi5505 has a hardware DVD compliant subpicture decoder. Subpicture units are copied by DMA into subpicture bit buffer.

The subpicture decoder can decode complete subpicture units without any interaction from the ST20.

The main subpicture decoder features are :

- up to 720x480 or 720x576 subpicture area,
- internal LUTs for Sub Picture, Highlight and PCI (4 bits color and contrast outputs),
- internal color LUT (4 bits from SP, HL, PCI to 24 Y,Cr,Cb bits) for SP color inputs to MPEG, OSD, SP mixer.

I.4 - Audio Decoder

The audio decoder cell is a fully compatible Dolby AC-3™ / MPEG-1/MPEG-2 decoder capable of decoding both 5.1 and 2 channel streams compatible with the DVD standard.

Downmix from 5.1 channels is supported for both Dolby and MPEG-2 streams. The output can be sent directly to external DACs or formatted for transmission in accordance with the IEC6958 standard.

The decoder can also handle linear PCM in accordance with the DVD standard. An integrated downsampler is provided for conversion from 96 kHz to 48kHz.

STi5505 (Rev. Ax)

I - GENERAL DESCRIPTION (continued)

The main features of the decoder core are :

- Decodes 5.1 Dolby AC-3 Digital surround,
- Output to 6 channels. Downmix modes : 1, 2, 3 or 4 channels for MPEG and AC-3 streams,
- Karaoke mode for DVD. MPEG-2 capable, AC-3 capable,
- MPEG-1, 2-channel audio decoder layers 1 and 2,
- MPEG-2, 6-channel audio decoder layer 2,
- PCM : transparent. downsampling 96 to 48 kHz,
- Accepts MPEG-2 PES stream format for : MPEG-2, MPEG-1, Dolby AC-3 and Linear PCM,
- IEC6958 Output Interface,
- CD-DA PCM format (subcode output in IEC6958 user data),
- Downmix for Dolby Pro Logic compatible outputs for AC-3 and MPEG-2 (Pro Logic encoder),
- Pro Logic decoder,
- PLL for Internal 44.1 and 48kHz PCM clock generation,
- On chip pink noise generator.

I.5 - High Performance On-Screen Display

The graphics performance of the STi5505 supports the new requirements for intelligent program guides and interactive applications.

The display interface supports up to 256 colors for each OSD region and a transparency feature allows mixing of video with the OSD. Fast access graphics and many other additional features are available and are supported by a graphics library.

Very high system performance is obtained by closely coupling the ST20 RISC processor and cache with the MPEG audio/video core and display memory.

Low latency RISC access and DMA engines allow rapid construction of bit maps.

I.6 - PAL/NTSC Encoder

The STi5505 integrates a PAL/NTSC encoder. It converts the digital MPEG/Sub Picture/OSD stream into a standard analog baseband PAL/NTSC signal and into RGB analog components. Six analog output pins are available on which it is possible to output CVBS, S-VHS (Y/C) and RGB formats.

The encoder handles interlaced and non-interlaced mode.

It can perform Closed Captions, CGMS or Teletext encoding and allows Macrovision 7.01/6.1 copy protection.

The encoder supports both master and slave modes for synchronization.

I.7 - Memory Interfaces

The STi5505 has been designed to minimize system costs by enabling various memory savings. Two kinds of memory interfaces are used on the STi5505 : a programmable External Memory Interface (EMI) and a high performance SDRAM interface.

The External Memory Interface supports several address ranges (memory banks). In each bank, a set of signals are entirely programmable and can be used to map 8/16 bits peripherals such as Front End channel ICs in DVD applications.

The EMI contains a zero glue logic DRAM and a low-cost EPROM interface.

This interface can be programmed to interface very easily peripherals.

The SDRAM memory interface supports gluelessly 125 MHz SDRAMs providing the adequate bandwidths to achieve MPEG decoding and display, OSD drawing and display, and general system use.

Memory savings can be realized on ROM requirements too : the ST20 VL-RISC micro-core has the highest code density of any 32 bit CPU, leading to the lowest cost program ROM.

I.8 - Front-End Interface

The STi5505's front end interface accepts :

- DVD, VCD and CD-DA sectors,
- DVB-DSS transport stream.

In DVD mode, DVD, VCD and CD-DA information can be input into STi5505 through a serial interface or a generic parallel interface.

In serial mode, data are captured and filtered from I2S and V4 interfaces by an internal sector processor. V4 interface is used to capture VCD and CD-DA subcode information. In parallel mode, sector processor is bypassed.

I - GENERAL DESCRIPTION (continued)

The main features of the DVD interface are :

- DVD, VCD and CD-DA compatible,
- hardware sector filtering,
- subcode error correction for CD-DA,
- integrated CSS decryption,
- integrated track buffer support,
- DMA engine to ST20 memory.

In DVB-DSS mode, DVB-DSS transport stream is input through a serial interface. The ST5505 extracts and descrambles Packet Elementary Streams belonging to one user selected program to be decoded and presented.

The main features of the DVB-DSS interface are :

- descrambling (transport packet and packet elementary streams in DVB mode, transport packet in DSS mode ; up to 32 streams descrambling),
- PID and section filtering,
- clock recovery,
- DMA engine.

In DVB-DSS mode, a high speed digital interface

allows to transfer packets between the Set Top Box and external units, either for recording or playback purposes. This interface provides also full support for an external IEEE1394 connection.

1.9 - Integrated Peripherals

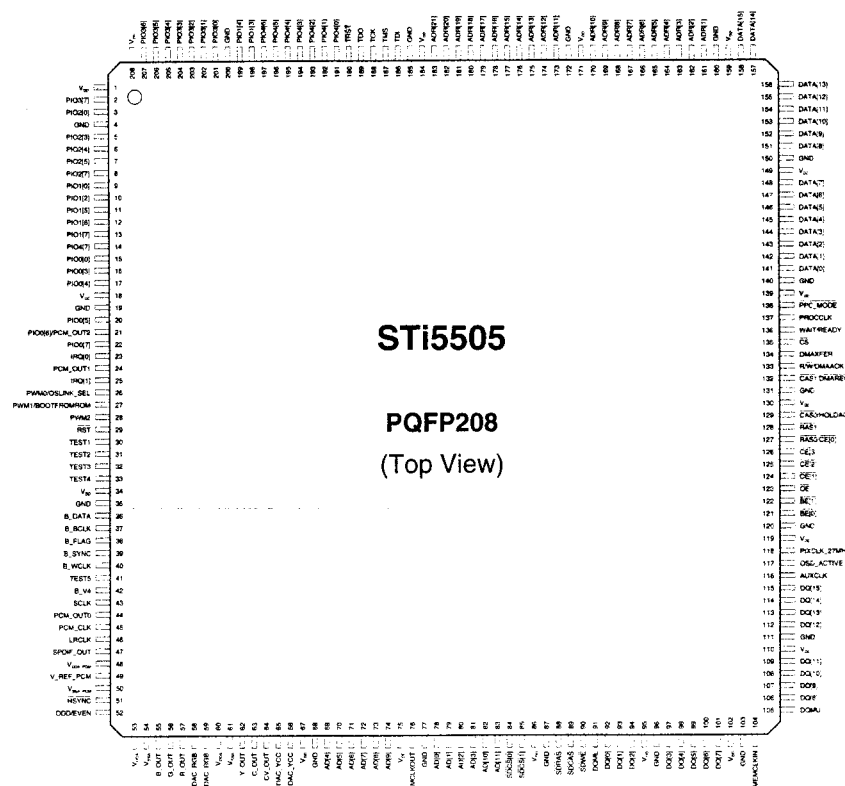
Several peripherals generally used in DVD players or DVD-DVB combos have been integrated into the STi5505.

They are :

- two UARTs to interface remote control receivers, DVD front end, modem ... ,
- one I²C controller to interface serial memories, remote control receivers, microcontrollers...,
- 2 SmartCard interfaces (ISO7816-3) for DVB-DSS conditional access, pay per view ... ,
- PWM/timer module for control of system clock,
- 34 programmable I/O pins,
- OS Link interface,
- JTAG with boundary scan for debug.

II - PIN DESCRIPTION

11.1 - Pin Connections



STI5505 (Rev. Ax)

II - PIN DESCRIPTION (continued)

II.2 - Pin List

Pin	Name	Type	Function
SUPPLIES			
1, 18, 34, 67, 75, 86, 95, 102, 110, 119, 130, 139, 149, 159, 171, 184, 208	V _{DD}		Power Supply
4, 19, 35, 68, 77, 87, 96, 103, 111, 120, 131, 140, 150, 160, 172, 185, 200	GND		Ground
53, 60	V _{DDA}		Analog Power Supply for DENC D/A Converters
54, 61	V _{SSA}		Analog Ground for DENC D/A Converters
48	V _{DDA_PCM}		Analog Power Supply for PLL PCM
49	V _{REF_PCM}		Analog Reference for PLL PCM
50	V _{SSA_PCM}		Analog Ground for PLL PCM

FRONT-END INTERFACE

36	B_DATA	I	I ² S Data (DVD) or PARA_DATA[2] (DVD/I) or Link Data (DVB/DSS)
40	B_WCLK	I/O	I ² S Word Clock or PARA_DATA[6] (DVD/I) or NRSS_CLK (DVB/DSS)
37	B_BCLK	I	I ² S Bit Clock (DVD) or PARA_DATA[3] (DVD/I) or Link Bit Clock (DVB/DSS)
38	B_FLAG	I	Error Flag (DVD) or PARA_DATA [4] (DVD/I) or Link Sync (DVB/DSS)
39	B_SYNC	I	Sector / Abs Time Sync (DVD) or PARA_DATA[5] (DVD/I) or Link Not Valid (DVB/DSS)
42	B_V4	I	Versatile Input Pin (Subcode Input) or PARA_DATA[7] (DVD/I) or NRSS_IN (DVB/DSS)

VIDEO OUTPUT INTERFACE

57	R_OUT	O	Red Output
56	G_OUT	O	Green Output
55	B_OUT	O	Blue Output
63	C_OUT	O	Chroma Output
64	CV_OUT	O	Composite Video Output
62	Y_OUT	O	Luma Output
59	I_REF_DAC_RGB	I	DAC Current Reference
66	I_REF_DAC_YCC	I	DAC Current Reference
58	V_REF_DAC_RGB	I	DAC Voltage Reference
65	V_REF_DAC_YCC	I	DAC Voltage Reference
117	OSD_ACTIVE	I/O	OSD Active
118	PIXCLK_27MHz	I	System Clock Input
51	HSYNC	I/O	Horizontal Sync
52	ODD/EVEN	I/O	Vertical Sync

AC-3/MPEG1-2 AUDIO OUTPUT INTERFACE

43	SCLK	O	Serial Bit Clock
44	PCM_OUT0	O	Audio Serial Output Data 0
24	PCM_OUT1	O	Audio Serial Output Data 1
21	PCM_OUT2	O	Audio Serial Output Data 2
45	PCM_CLK	I/O	PCM Clock In or Out
46	LRCLK	O	Left/Right Clock
47	SPDIF_OUT	O	SPDIF Output

STI5505 (Rev. Ax)

II - PIN DESCRIPTION (continued)

II.2 - Pin List (continued)

Pin	Name	Type	Function
EXTERNAL INTERRUPTS			
23, 25	IRQ[0:1]	I	External Interrupts
PROGRAMMABLE I/O AND ALTERNATE FUNCTION (see Device Configuration Chapter)			
15	PIO0 [0]	I/O	General Purpose I/O or PARA_SYNC (DVD/Front End) or Sc1Data (Smart Card 1 Data I/O)
16	PIO0 [3]	I/O	General Purpose I/O or PARA_REQ (DVD/Front End) or Sc1Clk (Smart Card 1 Clock)
17	PIO0 [4]	I/O	General Purpose I/O or PARA_STR (DVD/Front End) or Sc1RST (Smart Card 1 Reset)
20	PIO0 [5]	I/O	General Purpose I/O or PARA_DATA[0] (DVD/Front End) or Sc1Cmd V _{CC} (Smart Card 1 Voltage Enable)
21	PIO0 [6]	I/O	General Purpose I/O or Sc1DataDir (Smart Card 1 Dir)
22	PIO0 [7]	I/O	General Purpose I/O or PARA_DATA[1] (DVD/Front End) or Sc1Detect (Smart Card 1 Detect)
9	PIO1 [0]	I/O	General Purpose I/O or I ² C Data
10	PIO1 [2]	I/O	General Purpose I/O or I ² C Clock
198, 199	PIO1 [3:4]	I/O	General Purpose IO
11	PIO1 [5]	I/O	General Purpose IO or ASC1 TXD
12	PIO1 [6]	I/O	General Purpose IO or ASC1 RXD
13	PIO1 [7]	I/O	General Purpose IO or ASC3 TXD
3	PIO2 [0]	I/O	General Purpose I/O or Sc0Data (Smart Card 0 Data I/O)
5	PIO2 [3]	I/O	General Purpose I/O or Sc0Clk (Smart Card 0 Clock)
6	PIO2 [4]	I/O	General Purpose I/O or Sc0RST (Smart Card 0 Reset)
7	PIO2 [5]	I/O	General Purpose I/O or Sc0CmdV _{CC} (Smart Card 0 Voltage Enable)
8	PIO2 [7]	I/O	General Purpose I/O or Sc0Detect (Smart Card 0 Detect)
201	PIO3 [0]	I/O	General Purpose IO or OSLink In
202	PIO3 [1]	I/O	General Purpose IO or OSLink Out
203	PIO3 [2]	I/O	General Purpose IO or CPUReset
204	PIO3 [3]	I/O	General Purpose IO or CPU Analyse
205	PIO3 [4]	I/O	General Purpose IO or ErrorOut
206, 207, 2	PIO3 [5:7]	I/O	General Purpose IO
191-197	PIO4 [0:6]	I/O	General Purpose IO
14	PIO4 [7]	I/O	General Purpose IO or ASC3 RXD

JTAG INTERFACE

188	TCK	I	Test Clock
186	TDI	I	Test Data Input
189	TDO	O	Test Data Input
187	TMS	I	Test Mode Select
190	TRST	I	Test Reset

SYSTEM USE

28	PWM2	O	PWM2 Output
27	PWM1/BOOTFROMROM	O/I	PWM1 Output or Configuration Oslink Pins
26	PWM0/OSLINK_SEL	O/I	PWM0 Output or Boot from ROM during Reset
29	RST	I	Reset
116	AUXCLK	O	Auxiliary Clock for Any Purpose

STi5505 (Rev. Ax)

II - PIN DESCRIPTION (continued)

II.2 - Pin List (continued)

Pin	Name	Type	Function
SDRAM INTERFACE			
78-81, 69, 70-74, 82, 83	AD[0:11]	O	SDRAM Address Bus
92-94, 97-101, 106-109, 112-115	DQ[0:15]	I/O	SDRAM Data (Lower Byte)
84, 85	SDCS[0:1]	O	SDRAM Chip Selects
89	SDCAS	O	SDRAM CAS
88	SDRAS	O	SDRAM RAS
90	SDWE	O	SDRAM Write Enable
104	MEMCLKIN	I	SDRAM Memory Clock Input
76	MEMCLKOUT	O	SDRAM Memory Clock Output
91	DQML	O	DQ Mask Enable (Lower)
105	DQMU	O	DQ Mask Enable (Upper)

EXTERNAL MEMORY INTERFACE

161-170, 173-183	ADR[1:21]	I/O	External Memory Address Bus
141-148, 151-158	DATA[0:15]	I/O	External Memory Data Bus
128	RAS1/HOLDREQ	O	DRAM RAS or reserved
136	WAIT/READY	I/O	External Wait States or Reserved
133	R/W/DMAACK	I/O	DRAM R/W Strobe or Reserved
121, 122	BE[0:1]	O	Byte enable
129	CAS0/HOLDACK	O/I	DRAM CAS or Reserved
132	CAS1/DMAREQ	O	DRAM CAS or Reserved
124-126	CE[1:3]	O	Chip Select for Banks 1 - 3
135	CS	I	Reserved
137	PROCCLK	I/O	ST20 Clock or Reserved
127	RAS0/CE0	O	DRAM RAS or Chip Select for Bank 0
134	DMA XFER	I	Reserved
138	PPC_MODE	I	Reserved
123	OE	I/O	Output Enable or Reserved

SDAV/P1394 INTERFACE

30	TEST1	I/O	DATA_RX/STROBE_TX (SDAV Mode) or SDAV_CLK (P1394 Mode)
31	TEST2	I/O	STROBE_RX/DATA_TX (SDAV Mode) or DATA_IN/DATA_OUT (P1394 Mode)
32	TEST3	I/O	Direction (SDAV Mode) or DATA_VALID In/Out (P1394 Mode)

MISCELLANEOUS

41	TEST5	O	NRSS_OUT (DVB/DSS)
----	-------	---	--------------------

STi5505 (Rev. Ax)

III - FUNCTIONAL DESCRIPTION

III.1 - Functional Modules

Figure 1 shows the subsystem modules that make up the STi5505. These modules are outlined below.

III.1.1 - CPU

The Central Processing Unit (CPU) on the STi5505 is the ST20-C2 32-bit processor core. It contains instruction processing logic, instruction and data pointers and an operand register. It directly accesses the high speed on-chip SRAM memory, which can store data or programs, and uses the Caches to reduce access time to off chip program and data memory.

The processor can access memory via the general purpose External Memory Interface (EMI) or via the SDRAM EMI which is shared with the MPEG decoder.

III.1.2 - Memory Subsystem

The STi5505 on-chip SRAM memory system provides 160 Mbytes/s internal data bandwidth, supporting pipelined 2 cycles internal memory access at 25ns cycle times. The STi5505 memory system consists of 2 Kbytes of SRAM, 2 Kbytes of instruction cache, a 2 Kbytes data cache that can be programmed to be SRAM, and an external memory interface (EMI).

The STi5505 product has 2 Kbytes of on-chip SRAM. The advantage of this is the ability to store time critical code on chip, for instance interrupt routines, software kernels or device drivers, and even frequently used data without these being flushed from the caches.

The instruction and data caches are direct mapped with a write-back system for the data cache and support burst accesses to the external memories for refill and write-back which are effective for increasing performance with page-mode and SDRAM memories.

The STi5505 EMI controls access to the external memory and peripherals while the SDRAM EMI provides access to the SDRAM buffer for the MPEG decoders, ST20 and DMA peripherals.

The STi5505 EMI can access a 16 Mbytes (or greater if DRAM is used) physical address space in each of the four general purpose memory banks, and provides sustained transfer rates of up to 80 Mbytes/s. Peripherals that support an asynchronous data acknowledge are supported as is an external Power PC which can share the bus with the STi5505 and access the SDRAM buffer through the device.

High memory bandwidths up to 200 Mbytes/s can be supported by the SDRAM EMI.

The STi5505 internal memory interconnect provides buffering and arbitration of memory access requests to sustain very high throughput of memory accesses.

III.3 - System Services Module

The STi5505 system services module includes :

- Phase locked loop (PLL) - accepts 27MHz input and generates all the internal high frequency clocks needed for the CPU and the OS-Link.
- test access port - JTAG compatible.
- Diagnostics controller accessed via the JTAG port providing :
 - Bootstrapping during development
 - Hardware breakpoint and watchpoint
 - Real time trace
 - External LSA triggering support.

III.4 - Serial Communications

To facilitate the connection of this system the front end device and other peripherals, two UARTs (ASCs) are included in the device. The UARTs provide an asynchronous serial interface.

The UART can be programmed to support a range of baud rates and data formats, for example, data size, stop bits and parity. Two synchronous serial communications (SSC) interfaces are provided on the device. These can be used for a remote control device for example via an I²C or SPI bus.

III.5 - Interrupt Subsystem

The STi5505 interrupt subsystem supports eight prioritized interrupt levels. Two external interrupt pins are provided. Level assignment logic allows any of the internal or external interrupts to be assigned and, if necessary, share any interrupt level.

III.6 - Front End Interface & DVD Decryption

The front end interface accepts sectors in the case of DVD, MPEG-1 system stream in the case of VCD and PCM data for CD-DA applications on an I2S interface. In the case of VCD and CD-DA disks the subcode information is input via a simple asynchronous serial interface similar to a UART.

The bitstream and subcode stream then pass through a "sector processor" block which handles sector filtering in the case of DVD and sectorizing using the subcode stream for VCD and CD-DA systems.

STI5505 (Rev. Ax)

III - FUNCTIONAL DESCRIPTION (continued)

The block also handles overspeed processing for all systems. The capturing of CD-DA sectors is based on a flywheel timer to improve robustness by concealing errors in the subcode stream. For DVD the data, having had sector headers removed, then passes through a DVD conformant de-cryption stage and is written into any of the system memories using a programmable DMA engine. When a subcode stream is present it is locally buffered, by subcode block and can be read by the CPU for subsequent processing, if required.

III.7 - PWM and counter module

This unit includes three separate pulse width modulator (PWM) generators using a shared counter, and three timer compare and capture channels sharing a second counter.

The counters can be clocked from a pre-scaled internal clock or from a pre-scaled external clock via the capture clock input and the event on which the timer value is captured is also programmable.

The PWM counters are 8-bit with 8-bit registers to set the output high time. The capture/compare counter and the compare and capture registers are 32-bit.

III.8 - Parallel Programmable IO module

40 bits of parallel I/O are provided. 34 of them are connected to actual PIO pins. Each bit is programmable as an output or an input. The output can be configured as a totem pole or open drain driver. Input compare logic is provided which can generate an interrupt on any change on any input bit.

Many pins of the STI5505 device are multi-function and can either be configured as PIO or connected to an internal peripheral signal.

III.9 - MPEG Video decoder

The video decoder is a real-time video compression processor supporting the MPEG-1 and MPEG-2 standards at video rates up to 720 x 480 x 60 Hz and 720 x 576 x 50 Hz. Picture format conversion for display is performed by vertical and horizontal filters. User-defined bitmaps may be superimposed on the display picture through use of the on-screen display function.

III.10 - PAL/NTSC encoder

The digital encoder which is integrated in the STI5505 converts a multiplexed 4:2:2 YUV stream into a standard analog baseband PAL/NTSC signal and into RGB analog components. The encoder can also perform closed-caption, CGMS or teletext encoding

and allows Macrovision™ 7.01/6.1 copy protection.

III.11 - MPEG-2 Audio / Dolby AC-3 Decoder

The audio decoder is a Dolby AC-3 decoder capable of decoding both 5.1 and 2 channel DVD conformant bitstreams. The decoder also handles MPEG-1 (layers 1 & 2) and MPEG-2 layer 2 (6 channels). Downmix to 2 channels is possible for Dolby and MPEG standards with optional pro-logic encoding.

The decoder directly accepts MPEG-2 PES streams as input. The decoder is capable of supporting IEC6958-IEC61937 formatted outputs for AC-3 and MPEG audio, linear PCM (left & right, 16, 18, 20 & 24 bits), zero output (Mute mode) and PCM audio.

ST24E32
ST25E3232K SERIAL I²C EEPROM
with EXTENDED ADDRESSING

NOT FOR NEW DESIGN

- COMPATIBLE with I²C EXTENDED ADDRESSING
- TWO WIRE SERIAL INTERFACE, SUPPORTS 400kHz PROTOCOL
- 1 MILLION ERASE/WRITE CYCLES, OVER the FULL SUPPLY VOLTAGE RANGE
- 40 YEARS DATA RETENTION
- SINGLE SUPPLY VOLTAGE
 - ± 4.5V to 5.5V for ST24E32 version
 - ± 2.5V to 5.5V for ST25E32 version
- WRITE CONTROL FEATURE
- BYTE and PAGE WRITE (up to 32 BYTES)
- BYTE, RANDOM and SEQUENTIAL READ MODES
- SELF TIMED PROGRAMING CYCLE
- AUTOMATIC ADDRESS INCREMENTING
- ENHANCED ESD/LATCH UP PERFORMANCES
- **ST24E32 and ST25E32 are replaced by the M24C32**

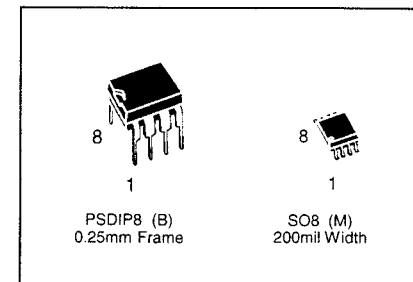
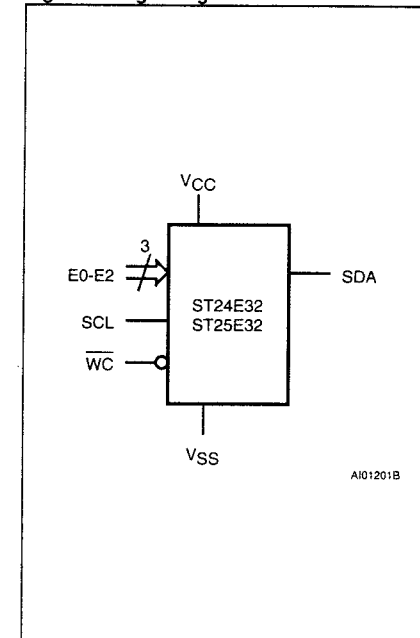


Figure 1. Logic Diagram



DESCRIPTION

The ST24/25E32 are 32K bit electrically erasable programmable memories (EEPROM), organized as 8 blocks of 512 x 8 bits. The ST25E32 operates with a power supply value as low as 2.5V. Both Plastic Dual-in-Line and Plastic Small Outline packages are available.

Table 1. Signal Names

E0 - E2	Chip Enable Inputs
SDA	Serial Data Address Input/Output
SCL	Serial Clock
WC	Write Control
Vcc	Supply Voltage
Vss	Ground

ST24E32, ST25E32

Figure 2A. DIP Pin Connections

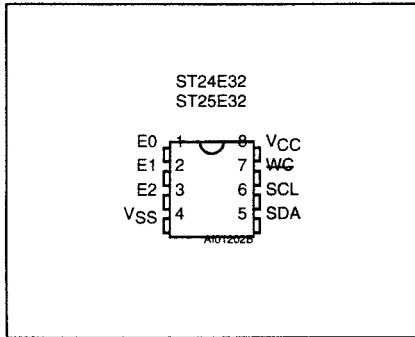


Figure 2B. SO Pin Connections

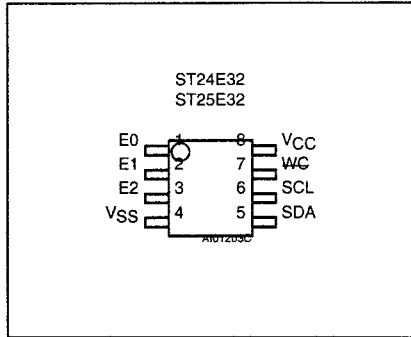


Table 2. Absolute Maximum Ratings ⁽¹⁾

Symbol	Parameter	Value	Unit
T _A	Ambient Operating Temperature	±40 to 125	°C
T _{STG}	Storage Temperature	±65 to 150	°C
T _{LEAD}	Lead Temperature, Soldering (SO8) (PSDIP8)	40 sec 215 10 sec 260	°C
V _{IO}	Input or Output Voltages	±0.6 to 6.5	V
V _{CC}	Supply Voltage	±0.3 to 6.5	V
V _{ESD}	Electrostatic Discharge Voltage (Human Body model) ⁽²⁾	4000	V
	Electrostatic Discharge Voltage (Machine model) ⁽³⁾	500	V

Notes: 1. Except for the rating "Operating Temperature Range", stresses above those listed in the Table "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only and operation of the device at these or any other conditions above those indicated in the Operating sections of this specification is not implied. Exposure to Absolute Maximum Rating conditions for extended periods may affect device reliability. Refer also to the SGS-THOMSON SURE Program and other relevant quality documents.
2. 100pF through 1500Ω; MIL-STD-883C, 3015.7
3. 200pF through 0Ω; EIAJ IC-121 (condition C)

DESCRIPTION (cont'd)

Each memory is compatible with the I²C extended addressing standard, two wire serial interface which uses a bi-directional data bus and serial clock. The ST24/25E32 carry a built-in 4 bit, unique device identification code (1010) corresponding to the I²C bus definition. The ST24/25E32 behave as

slave devices in the I²C protocol with all memory operations synchronized by the serial clock. Read and write operations are initiated by a START condition generated by the bus master. The START condition is followed by a stream of 4 bits (identification code 1010), 3 bit Chip Enable input to form a 7 bit Device Select, plus one read/write bit and terminated by an acknowledge bit.

9.24 Description of Furore IC

9.24.1 General Description

FUORE-IC is a one-chip design containing all the hardware required for SACD processing. It is intended to interface to the Sti family (Sti5505/Sti5508) DVD video decoders. The FUORE-IC contains a memory interface to support one 4M*16 SDRAM or one 1M*16 SDRAM device.

9.24.2 Blockdiagram

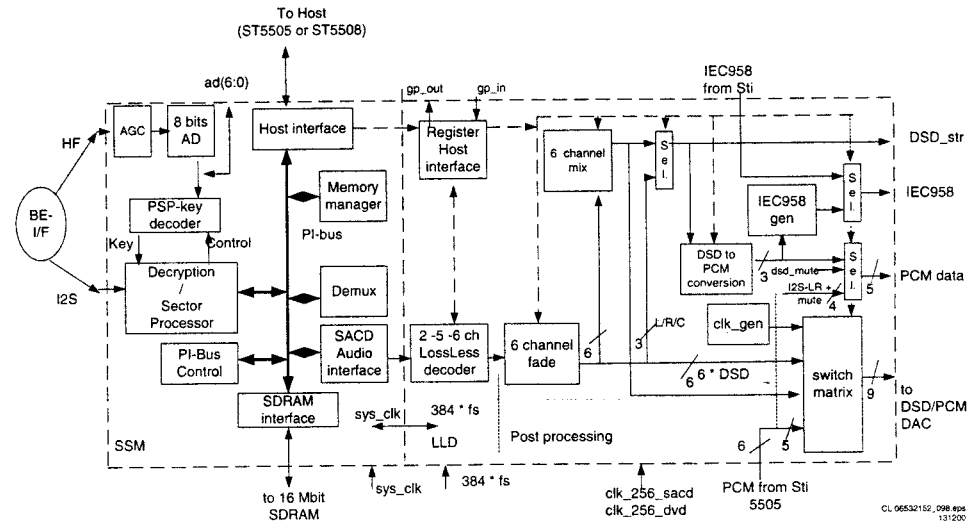


Figure 9-7

9.24.3 Basic Engine Interface

Data input interface.

The Basic Engine Interface is connected to the output of the SAA7335 (HD61)

Analogue HF input

The analogue HF input, coming from the optical pickup unit, is also fed to the Furore IC to extract the copyprotection information "PSP".

9.24.4 SDRAM Interface

The SDRAM interface forms a glueless interface to one 16Mbit or one 64 Mbit SDRAM device. The interface takes care for the power-up sequence, mode programming and refreshing of the SDRAM devices. This is hard coded in the interface and doesn't have to be controlled by the host.

9.24.5 Audio data input/output Interface

DSD/PCM combined data output.

DSD_PCM : Output intended for a combined 6 channel DSD (SACD) and PCM (DVD-CDDA) DAC. Switching between the PCM data coming from the Sti5505 and the internal generated DSD signals is done in the Furore IC.

Stereo DSD only output.

DSD_stereo: 2 channel DSD output, with stereo down mix in the case of 5 and 6 channel and normal stereo in case of 2 channel DSD mode.

Stereo PCM data output.

Two possible stereo sources can be selected as stereo PCM output:

- Stereo PCM coming from the Sti5505 via the PCM input on Furore.
- Stereo or down mix PCM derived via a decimation filter from the SACD-DSD signal.

Digital audio output interface (IEC958)

The IEC958 format is intended to connect the SACD 1000 to a digital receiver. No DSD signals are defined for IEC958 therefore the DSD->PCM converted signal will be transmitted. Following two types of signals are possible on the digital interface:

- IEC958 data coming from Sti5505.
- IEC958 data, Stereo or down mix PCM, derived via a decimation filter from the SACD-DSD signal.

Clock + reset input.

Two different processing clocks are needed in the Furore-IC:

- Sys_clk: System clock for data processing part, frequency can be 27 MHz or 768 * Fs.

RESETn is an asynchronous reset and should be low for at least 1 period of DSD_CLK.

9.24.6 Pin description

General-purpose in/outputs.

Four general purpose input and output signals are available.

IC-Pin_no	Name	Type	Function
1	H_DQ[13]	I/O5	Data bus
2	H_DQ[12]	I/O5	Data bus
3	VCC_IO	IN	3.3V power supply IO
4	GND_IO	IN	Ground
5	H_DQ[11]	I/O5	Data bus
6	H_DQ[10]	I/O5	Data bus
7	H_DQ[9]	I/O5	Data bus
8	H_DQ[8]	I/O5	Data bus
9	H_DQ[7]	I/O5	Data bus
10	H_DQ[6]	I/O5	Data bus
11	H_DQ[5]	I/O5	Data bus
12	H_DQ[4]	I/O5	Data bus
13	VCC_CORE	IN	3.3V power supply Core
14	GND_CORE	IN	Ground(core)
15	H_DQ[3]	I/O5	Data bus
16	H_DQ[2]	I/O5	Data bus
17	H_DQ[1]	I/O5	Data bus
18	H_DQ[0]	I/O5	Data bus
19	VCC_IO	IN	3.3V power supply IO
20	H_procclock	IN	Host processor EMI interface clock
21	GND_IO	IN	Ground
22	H_WAIT	O5	Wait signal
23	H_RWn	IN	READ=1, Write=0
24	H_CSLn	IN	Chip Select, active low
25	H_CSHn	IN	Chip select
26	H_ben(1)	IN	Byte Enable 1
27	H_ben(0)	IN	Byte Enable 0
28	B_V4	IN	Versatile Input Pin (contains Subcode), not used
29	B_SYNC	IN	Sector sync / Absolute time sync
30	B_FLAG	IN	I2S flag (EDC flag)
31	B_BCLK	IN	I2S Bit Clock
32	B_WCLK	IN	I2S Word CLock
33	B_DATA	IN	I2S Data
34	GP_in_pin(0)	IN	General purpose in
35	GP_in_pin(1)	IN	General purpose in
36	AD[6]	I/O5	
37	AD[5]	I/O5	
38	AD[4]	I/O5	
39	VCC_CORE	IN	3.3V power supply Core
40	GND_CORE	IN	Ground(core)
41	AD[3]	I/O5	
42	AD[2]	I/O5	
43	AD[1]	I/O5	
44	AD[0]	I/O5	Digital out of AD OR digital in for PLL
45	GP_in_pin (2)	IN	General purpose in
46	biasin	APIO	Current input. connect via 15K to VSS
47	vddaagc	VDDCO	VDD of AGC (+ 3.3V)
48	Agcadctstp	APIO	AGC Positive channel test pin
49	vssaagc	VSSCO	Analog ground for AGC.
50	agcinp	APIO	AGC positive input signal, HF in.
51	VCC_IO	IN	3.3V power supply IO
52	GND_IO	IN	Ground
53	agcadctstp	APIO	AGC Negative channel test pin
54	vssaadc	VSSCO	VSS of AGC & ADC connected to substrate
55	vddaadc	VDDCO	VDD of ADC (+3.3V)
56	adcreth	APIO	ADC decoupling high . (via 100nF to VSS)
57	Adcrefm	APIO	ADC decoupling middle . (via 100nF to VSS)

IC-Pin_no	Name	Type	Function
58	adcrefl	APIO	ADC decoupling low. (via 100nF to VSS)
59	vssrefadc	VSSCO	VSS of Reference Ladder of ADC (not to the substrate)
60	PCM_LeRi_in	IN	PCM data Left/Right
61	PCM_CeLf_in	IN	PCM data Centre/LFE
62	PCM_LsRs_in	IN	PCM data lift/Right surround
63	PCM_wclk_in	IN	PCM word clock
64	PCM_dclk_in	IN	PCM data clock
65	VCC_CORE	IN	3.3V power supply Core
66	GND_CORE	IN	Ground(core)
67	GP_in_pin (3)	IN	General purpose in
68	D_ADDR[4]	O5	SDRAM Address bus
69	D_ADDR[5]	O5	SDRAM Address bus
70	GND_IO	IN	Ground
71	D_ADDR[6]	O5	SDRAM Address bus
72	D_ADDR[7]	O5	SDRAM Address bus
73	D_ADDR[8]	O5	SDRAM Address bus
74	D_ADDR[9]	O5	SDRAM Address bus
75	VCC_IO	IN	3.3V power supply IO
76	D_clk	O5	Clock signal needed for SDRAM.
77	GND_IO	IN	Ground
78	D_ADDR[0]	O5	SDRAM Address bus
79	D_ADDR[1]	O5	SDRAM Address bus
80	D_ADDR[2]	O5	SDRAM Address bus
81	D_ADDR[3]	O5	SDRAM Address bus
82	VCC_IO	IN	3.3V power supply IO
83	GND_IO	IN	Ground
84	D_ADDR[10]	O5	SDRAM Address bus
85	D_ADDR[11]	O5	SDRAM Address bus
86	GND_IO	-	Ground.
87	D_RASn	O5	Row Address Select
88	D_CASn	O5	Column Address Select
89	D_Wen	O5	Read/Write
90	D_LDQM	O5	DQ mask enable (lower)
91	VCC_CORE	IN	3.3V power supply Core
92	GND_CORE	IN	Ground(core)
93	D_UDQM	O5	DQ mask enable (Upper)
94	D_DQ[0]	I/O5	Data bus
95	VCC_IO	IN	3.3V power supply IO
96	D_DQ[1]	I/O5	Data bus
97	D_DQ[2]	I/O5	Data bus
98	D_DQ[3]	I/O5	Data bus
99	D_DQ[4]	I/O5	Data bus
100	VCC_IO	IN	3.3V power supply IO
101	GND_IO	IN	Ground
102	D_DQ[5]	I/O5	Data bus
103	D_DQ[6]	I/O5	Data bus
104	D_DQ[7]	I/O5	Data bus
105	D_DQ[8]	I/O5	Data bus
106	D_DQ[9]	I/O5	Data bus
107	D_DQ[10]	I/O5	Data bus
108	D_DQ[11]	I/O5	Data bus
109	D_DQ[12]	I/O5	Data bus
110	VCC_IO	IN	3.3V power supply IO
111	GND_IO	IN	Ground
112	D_DQ[13]	I/O5	Data bus
113	D_DQ[14]	I/O5	Data bus
114	D_DQ[15]	I/O5	Data bus
115	D_ADDR[12]	O5	SDRAM Address bus
116	D_ADDR[13]	O5	SDRAM Address bus
117	VCC_CORE	IN	3.3V power supply Core
118	GND_CORE	IN	Ground(core)

IC-Pin_no	Name	Type	Function
119	DSD_PCM_0	O10	DSD data output signal. On 64 * Fs Stereo : Left channel (channel 0) MCA5/6 : front left (channel 0) OR From PCM switch matrix
120	DSD_PCM_1	O10	Stereo : right channel (channel 1) MCA 5/6 : front right (channel 1) OR From PCM switch matrix
121	DSD_PCM_2	O10	Stereo : mute sequence MCA 5/6 : front centre (channel 2) OR From PCM switch matrix
122	DSD_PCM_3	O10	stereo : mute sequence MCA-5 : mute sequence MCA-6 : LFE channel. (channel 3) OR From PCM switch matrix
123	VCC_IO	IN	3.3V power supply IO
124	GND_IO	IN	Ground
125	DSD_PCM_4	O10	Stereo : mute sequence MCA-5 : left surround (channel 3) MCA-6 : left surround (channel 4) OR From PCM switch matrix
126	DSD_PCM_5	O10	Stereo : mute sequence MCA-5 : right surround (channel 4) MCA-6 : right surround (channel 5) OR From PCM switch matrix
127	DSD_PCM_6	O5	DSD clock signal. OR From PCM switch matrix
128	DSD_PCM_7	O5	DSD stereo or down mix Left OR From PCM switch matrix
129	DSD_PCM_8	O5	DSD stereo or down mix Right OR From PCM switch matrix
130	DSD_str(0)	O10	DSD stereo or downmix on DSD.
131	DSD_str(1)	O10	DSD stereo or downmix on DSD.
132	dsd_clk	O5	DSD clock for DSD stereo signal.
133	VCC_IO	IN	3.3V power supply IO
134	GND_IO	IN	Ground
135	PCM_LeRi_Out	O10	PCM data Left/Right to AV PCB
136	PCM_wclk_Out	O5	PCM word clock
137	fs_256_sacd	IN	256 * Fs audio clock generated for SACD (Fs=44.1Khz)
138	mute_tot	O10	Selectable mute signal from PCM source or internal SACD source.
139	fs_256_dvd	IN	256 * Fs audio clock generated for DVD (Fs=48 kHz)
140	RESETn	IN	Asynchronous Reset
141	D_cke	O5	Clock enable output to SDRAM to enable the power down mode.
142	PCM_clk_Out	O5	256 * fs O10put./384 * Fs O10
143	VCC_CORE	IN	3.3V power supply Core
144	GND_CORE	IN	Ground(core)
145	PCM_mute_in	IN	PCM mute signal.
146	IEC958_in	IN	IEC958 input from SII5505
147	IEC958_Out	O10	IEC958 O10put
148	VCC_IO	IN	3.3V power supply IO
149	CLK	IN	system Clock 27 Mhz
150	GND_IO	IN	Ground
151	GP_out_pin (0)	O10	General purpose out
152	GP_out_pin (1)	O10	General purpose out
153	GP_out_pin (2)	O10	General purpose out
154	GP_out_pin (3)	O10	General purpose out
155	Prog_clk_sys	O10	Clock divide from system clock.
156	Prog_clk_384	O10	Clock divided from 384 * Fs LLD clock.
157	Pll_lock	O10	Indication that PLL is in lock
158	VCC_IO	IN	3.3V power supply IO
159	clk_384	IN	DSD system clock 384*Fs = 16.934400Hz
160	GND_IO	IN	Ground
161	Pll_sync	O10	Serial sync found
162	Psp_enable	O10	If '1' PSP circuit is active
163	75hz_pulse	O10	75 Hz pulse to audio interface
164	Ssm_act	O10	Indication new frame is being transmitted
165	Lld_mute	O10	If '1' mute indication from audio interface
166	Play	O10	If '1' Fade circuit is in LLD mode
167	mute_det	O10	Mute 0x69 for all channels detection
168	Fade_busy	O10	Indication that fade in/out is busy
169	Do_grab	O10	Active data out of LLD.
170	VCC_CORE	IN	3.3V power supply Core

IC-Pin_no	Name	Type	Function
171	GND_CORE	IN	Ground(core)
172	PCM_dclk_Out	O5	PCM data clock
173	Tst(1)	IN	internal pull up for both test pins
174	Tst(0)	IN	IC testpins tst(1:0) 11 : Functional behaviour 10 : RAM test 01 : scan shift 00 : scan normal
175	TDI	IN	Boundary scan Data Input.
176	TMS	IN	Boundary scan Mode select
177	TCK	IN	Boundary scan Clock
178	TDO	O10	O10put
179	TRST	IN	Boundary scan Reset.
180	GND_IO	IN	Ground
181	H_IRQn	O5	Interrupt Request, active low
182	H_A22	IN	Data Strobe, active low
183	H_A[21]	IN	Address bus
184	H_A[20]	IN	Address bus
185	H_A[19]	IN	Address bus
186	H_A[18]	IN	Address bus
187	H_A[17]	IN	Address bus
188	H_A[16]	IN	Address bus
189	H_A[15]	IN	Address bus
190	H_A[14]	IN	Address bus
191	H_A[13]	IN	Address bus
192	H_A[12]	IN	Address bus
193	H_A[11]	IN	Address bus
194	H_A[10]	IN	Address bus
195	VCC_CORE	IN	3.3V power supply Core
196	GND_CORE	IN	Ground(core)
197	H_A[9]	IN	Address bus
198	H_A[8]	IN	Address bus
199	H_A[7]	IN	Address bus
200	H_A[6]	IN	Address bus
201	H_A[5]	IN	Address bus
202	H_A[4]	IN	Address bus
203	H_A[3]	IN	Address bus
204	H_A[2]	IN	Address bus
205	H_A[1]	IN	Address bus
206	VCC_IO	IN	3.3V power supply IO
207	H_DQ[15]	I/O5	Data bus
208	H_DQ[14]	I/O5	Data bus

9.25 Circuit description of DAC board

9.25.1 Description

The DAC board has 6 high performance audio outputs. It consists of 3 D/A converters and their appropriate filters, the clock generator part, the filter-control part and the muting-control part (See block diagram).

Key components are D/A converter CS4397 and I2C controller PCF8574.
The DAC board supports DSD and PCM. The digital data are sent from the MONO board to the DAC's QD41, QD51 and QD61 via a flex and connector JD01. The audio signals are sent to the cinches via a 2 or 1 filter stage. In these filter stages discrete opamp's are used.
The DAC board is I2C controlled via the I2C bus from the mono board to the DAC's and I2C controller QD21.
The differences between DSD mode and PCM mode are shown in the table below:
Digital audio data

Pin number	PCM mode	DSD mode
11	BCK	BCK
12	LRCK	SEL_DSD
13	SDT	DSD_L
14	SEL_PCM	DSD_R

MCLK

AUDIO SIGNAL	MCLK
DSD(SACD)	192Fs(8.4672 MHz)
PCM audio (Fs = 44.1 kHz) (CD)	384Fs(16.9344 MHz)
PCM audio (Fs = 32.4896 kHz)	256Fs

9.25.2 Filter setting

The user can select 3 filter settings using switch SD71 at the rear of the set. This is only effective during the playback of SACD discs. See the table below.

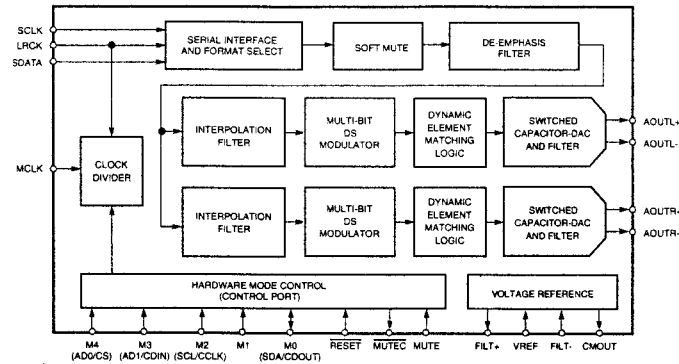
DISCS	Filter switch position		
	Position 1	position 2	position 3
SACD (DSD)	All channels: Normal*	L and R: Custom* Other channels: Normal	All channels: Custom
CD (PCM)	All channels : Custom		

- Normal: output via 1 filter stage (3rd order filter)
- Custom: output via 2 filter stage (6th order filter)

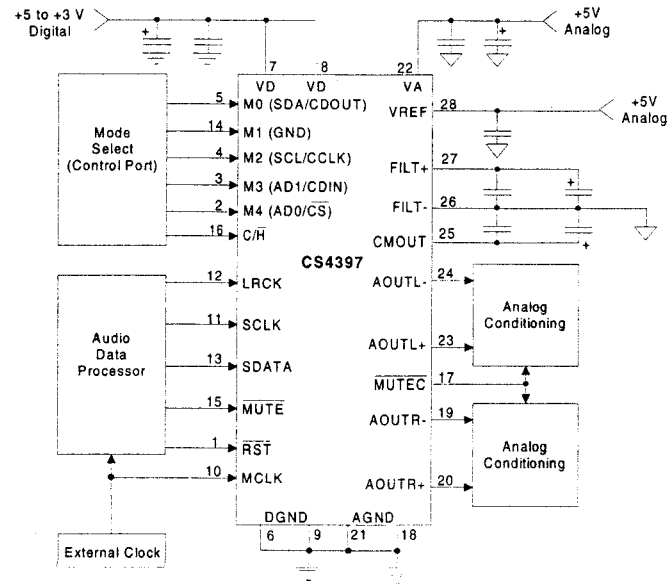
9.25.3 Description of DAC CS4397

CS4397

Block Diagram



Pin Configuration



Typical Connection Diagram - Hardware Mode (Control Port Mode)

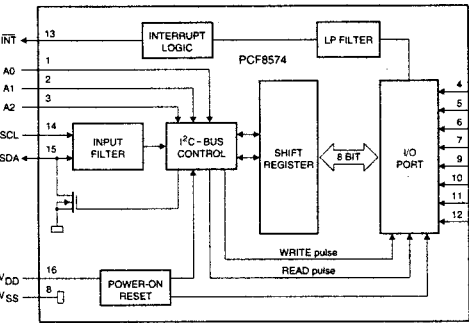
Pin Function

No.	Pin Name	I/O	Description
1	RST	I	Reset input (Low active)
2	M4(AD0/CS)	I	Chip address bit0 for I2C
3	M3(AD1/CDIN)	I	Chip address bit1 for I2C
4	M2(SCL/CCLK)	I	Serial clock for I2C
5	M0(SDA/CDOUT)	I/O	Serial data for I2C
6	DGND		Digital ground
7	VD		Digital power supply +3.3V
8	VD		Digital power supply +3.3V
9	DGND		Digital ground
10	MCLK	I	Master clock PCM mode:256Fs DSD mode:192Fs (8.4672MHz)
11	SCLK	I	Serial data clock
12	LRCK(PCM) CLKMODE(DSD)	I I	PCM mode:Left/Right channel clock DSD mode:Select MCLK to DSD data rate clock ratios
13	SDATA(PCM) DSD_L(DSD)	I	PCM mode:Serial audio data DSD mode:Direct Stream Digital audio data (Left)
14	M1(PCM) DSD_R(DSD)	I	PCM mode:(Low) DSD mode:Direct Stream Digital audio data (Right)
15	MUTE	I	Mute input (Low active)
16	C/H	I	Control port (H) /Hardware (L) mode select
17	MUTEC	O	Mute control (Low active)
18	AGND		Analog ground
19	AOUTR-	O	Right channel negative Analog out
20	AOUTR+	O	Right channel positive Analog out
21	AND		Analog ground
22	VA		Analog power supply +5.5V
23	AOUTL+	O	Left channel positive Analog out
24	AOUTL-	O	Left channel negative Analog out
25	CMOUT	O	Common mode voltage
26	FILT-	I	Reference ground
27	FILT+	O	Reference filter
28	VREF		Voltage reference input

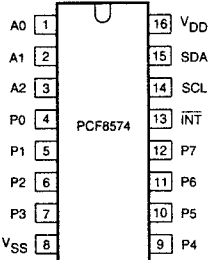
9.25.4 Description of I2C controller PC8574

PC8574

Block Diagram



Pin Configuration



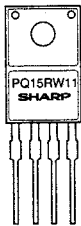
Pin Function

SYMBOL	PIN		DESCRIPTION
	DIP16; SO16	SSOP20	
A0	1	6	address input 0
A1	2	7	address input 1
A2	3	9	address input 2
P0	4	10	quasi-bidirectional I/O 0
P1	5	11	quasi-bidirectional I/O 1
P2	6	12	quasi-bidirectional I/O 2
P3	7	14	quasi-bidirectional I/O 3
VSS	8	15	supply ground
P4	9	16	quasi-bidirectional I/O 4
P5	10	17	quasi-bidirectional I/O 5
P6	11	19	quasi-bidirectional I/O 6
P7	12	20	quasi-bidirectional I/O 7
INT	13	1	interrupt output (active LOW)
SCL	14	2	serial clock line
SDA	15	4	serial data line
VDD	16	5	supply voltage
n.c.	-	3	not connected
n.c.	-	8	not connected
n.c.	-	13	not connected
n.c.	-	18	not connected

9.26 IC description of Linear power supply

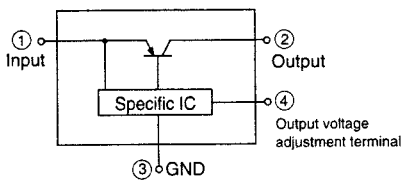
PQ15RW11

Pin Configuration

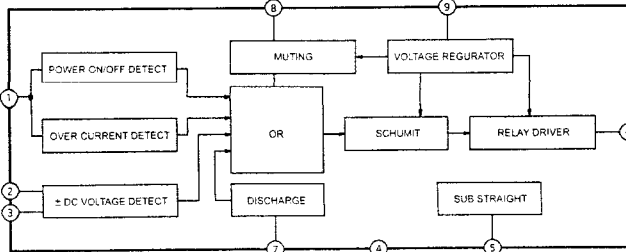
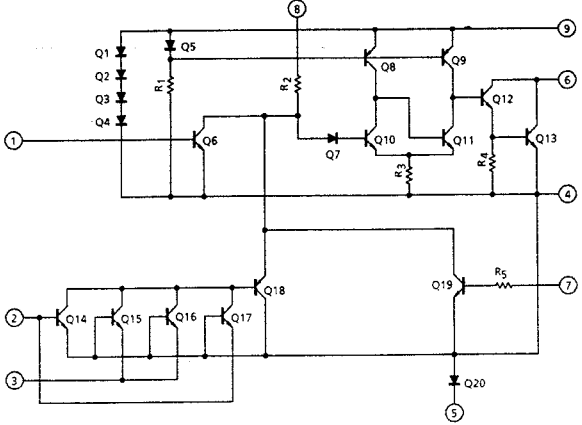


- ① DC input(Vin)
- ② DC output(Vo)
- ③ GND
- ④ Output voltage adjustment terminal(Vadj)

Block Diagram



TA7317P



9.27 List of abbreviations			
+12VSTBY	+12V power supply present during standby	CASF_MACE	Central aperture low frequency control signal to MACE
+3A	Filtered 3V3 power supply to IC7207(MACE servo processor)	CAS{1:0}ND	DRAM column address strobe
+3V3	3V3 power supply	CASN	SDRAM column address strobe
+3V3S	Stabilised 3V3 power supply from IC7605 to MACE (IC7207) circuit	CE_ROM1N	Chip enable flash eeprom IC7401
+5V	+5V power supply	CE_ROM2N	Chip enable flash eeprom IC7451
+5VA	Filtered +5V: analog power supply for IC7311(HD61 decoder)	CE_ROMN	Chip enable ROM memory (flash access)
+5VB	Filtered +5V: digital power supply for IC7311(HD61 decoder)	CENTRE_ON	Control signal from Sti5505 to AV board to switch STEREO OUTPUT cinch to mono.
+5VC	+5V power supply for IC7202(servo flash eeprom)	CFLG	Correction flag output
+5VSTBY	+5V power supply present during standby	CFR	Control processor ready to accept data (S2B)
+5VX	+5V power supply for IC7105(opamp)	CLK	Clock for SDRAM memory
+6VSTBY	+6V power supply present during standby	COSPH	Position Control Sledge in
+9V	Stabilised +9V power supply from IC7109 to IC7103 (Servo power driver)	CPUANALYSE	Control port P3 I/O from Sti5505
0_6_12V	Scart switch control signal to A/V board. 0V : loop through (AUX to TV), 6V : play 16:9 format, 12V : play 4:3 format	CPURESET	Control port P3 I/O to Sti5505
1.5V	1.5V reference voltage for IC7102 (DVDALAS)	CSH_FUR	FURORE chip select the upper bank
2.0V	2V reference voltage for IC7102 (DVDALAS)	CSI	Chip select input of HD61 (servo)
2.5V	2.5V reference voltage for IC7102 (DVDALAS)	CSL_FUR	FURORE chip select the lower bank
27M_CLK	27MHz clock out of the PLL-Master clock for the main processor (IC7503)	CSN{2:1}	SDRAM chip select
384FS_IN	SACD clock from DAC PCB	CTS_SER	Clear to send control signal of service serial interface
75HZ_PULSE	75Hz pulse to audio interface indication output	CVBS	Buffered composite video output to A/V board
-8VSTBY	-8V power supply present during standby	CVBS_OUT	Composite video output from Sti5505
A{20:1}	System address bus (EMI)	D	Central photodiode signal
A1_MACE	Amplitude of the "land" reflection relative to the average EFM	D{15:0}	System data bus (EMI)
AD{11:0}	SDRAM address bus	DO_GRAB	Active data out of LLD (LossLess Decoder). Indication output
ALE	Address latch enable (servo processor)	DQ{15:0}	SDRAM data bus
ALPHA0	Generic name for the setpoint of the laser power absorption control	DQML	SDRAM data mask enable (Lower)
AM{7:0}	Latched low address bus to servo flash	DQMU	SDRAM data mask enable (Upper)
AM{17:8}	High address bus to servo flash	DSD	Direct Stream Digital
AMD{7:0}	Multiplexed address data bus to servo flash	DSD_CLK	DSD clock for DSD stereo signal
Ax	Central photodiode signal	DSD_PCM{8:0}	DSD data
B	Central photodiode signal	DSD_STR{1:0}	DSD stereo or downmix on DSD
B_BCLK	Basic engine I2S bit clock	DST	Direct Stream Transfer
B_DATA	Basic engine I2S data	DVD_LDN	Control signal from MACE to loader supply IC7107
B_FLAG	Basic engine error flag	E	Satellite photodiode signal
B_OUT	Video output blue from Sti5505	EMI_IRQN	Interrupt request, active low
B_SYNC	Basic engine sector /abs time sync	ERROROUT	Control port P3 I/O from Sti5505
B_V4	Basic engine versatile input pin	F	Satellite photodiode signal
B_VID	Buffered video output Blue to A/V board	FADE_BUSY	Indication that fade in/out is busy
B_WCLK	Basic engine I2S word clock	FLASH_OEN	FLASH output enable control signal
BE1N_FUR	Upper byte enable of the Furore	FO	Focus actuator output
BEON_FUR	Lower byte enable of the Furore	FOC-	Focus actuator negative connection
C_OUT	Chrominance output from Sti5505	FOC+	Focus actuator positive connection
C_VID	Buffered Chrominance output to A/V board	FUR_AD{13:0}	FURORE SDRAM address bus
		FUR_CASN	Furore SDRAM column address strobe
		FUR_CKE	Furore SDRAM clock enable
		FUR_CLK	Furore SDRAM clock
		FUR_DQ{15:0}	FURORE SDRAM data bus
		FUR_DQMh	FURORE SDRAM data mask enable (Upper)
		FUR_DQML	FURORE SDRAM data mask enable (Lower)
		FUR_RASN	Furore SDRAM row address strobe
		FUR_TDI	Boundary scan test data input
		FUR_TMS	Boundary scan test mode select
		FUR_TRST	Boundary scan test port reset
		FUR_WEN	Furore SDRAM write enable
		G_OUT	Video output green from Sti5505
		G_VID	Buffered video output Green to A/V board
		GND	Ground
		GP_IN_PIN{3:0}	Furore general purpose input port
		GP_OUT_PIN{3:0}	Furore general purpose output port
		HPSW	Control signal to switch HF signal path
		HSYNC	Horizontal synchronization output
		I2C_DAC	Control signal to enable/disable the I2C bus to the DAC PCB
		INT	Interrupt request
		KAR_BY_PASS	Karaoke bypass control signal from Sti5505 to AV board.
		LD-CD	CD laser out
		LD-DVD	DVD laser out
		LLD_MUTE	LossLess Decoder Mute, if "1" mute indication from audio interface
		LRCLK	PCM Left/Right clock (word clock) to AV board
		LRCLK_AV	PCM Left/Right clock (word clock) to AV board
		LRCLK_FUR	PCM Left/Right clock (word clock) to the FURORE
		LRCLKO	PCM Left/Right clock (word clock) output from Sti5505
		MON1	CD laser monitor
		MON2	DVD laser monitor
		MOTO1	Motor control signal
		MUTE	Mute control signal
		MUTE_AV	Mute control signal to AV board
		MUTE_DET	Mute detection, mute 0x69 for all channels detection
		O{4:1}	Servo current outputs for focus control
		O-CENTRAL	Testpin for offset cancelation
		OEND	DRAM output enable
		OSLINKIN	Control port P3 I/O to Sti5505
		OSLINKOUT	Control port P3 I/O from Sti5505
		P50	Off track detection
		PCM_CELF_FUR	Bi-directional interface used for equipment
		PCM_CLK_FUR	I2S center/subwoofer serial data line
		PCM_CLK_ST	Audio system clock to FURORE
		PCM_LERI_FUR	Audio system clock to Sti5505
		PCM_LSRS_FUR	I2S left right data line to the FURORE
		PCM_OUT0	I2S left/right surround serial data line
		PCMCLK_AV	I2S audio serial data out of the Sti5505
		PCMOUT_AV	I2S audio system clock to A/V PCB
		PLAY	I2S audio serial output data to A/V PCB
		PLL_LOCK	If "1" Fade circuit is in LLD mode, indication output
		PLL_SYNC	Indication that PLL is in lock
		POR	Sector sync found indication
		PORN	Power on reset
		PROG_CLK384	Power on reset active low
		PROG_CLKSYS	Clock divide from 384*Fs = 16.9344 Hz
		PSEnN	Clock divide from system clock
		PSP	Program strobe enable (Servo)
		PSP_ENABLE	Pit Signal Processing
		PWR_FAIL	If "1" PSP circuit is active, indication output
		R_OUT	Power fail control signal from PSU
		R_VID	Video output Red from Sti5505
		RA	Buffered video output Red to A/V board
		RAC-SW	Radial actuator control signal from servo processor to power driver
		RAD-	Radial control switch
		RAD+	Radial actuator negative connection
		RAMAD{14:0}	Radial actuator positive connection
		RAMDA{7:0}	RAM memory address bus (Servo)
		RAMRW	RAM memory data bus (Servo)
		RAS{1:0}ND	RAM memory read/write control signal (Servo)
			DRAM row address strobe
		RASN	SDRAM row address strobe
		RDI	Read enable input of HD61
		REFCOS	Position Control Sledge external cosine offset compensation/stepper motor cosine output
		REFSIN	Position Control Sledge external sine offset compensation/stepper motor sine output
		RESET_I2C	Reset I2C
		Rfo	Amplified HF signal to HD61
		RFP	Amplified HF signal for PSP recognition
		RSTN	System reset
		RTS_SER	Ready to send control signal of service serial interface
		RWN	Read/Write control signal (EMI)
		RXD_BE	Receive data of basic engine serial interface (S2B)
		RXD_SER	Receive data of service serial interface
		S{2:1}	Servo current outputs for radial tracking
		SACD_CLK	SACD clock 16.394 MHz, CLK source of the system
		SCART{1:0}	Scart control signals: slow blanking
		SCL	I2C bus clock
		SCL_DAC	I2C bus clock to DAC PCB
		SCLK	PCM I2S serial bit clock
		SCLK_AV	PCM I2S serial bit clock to A/V PCB
		SCLK_FUR	PCM I2S serial bit clock to the FURORE
		SCLKo	PCM I2S serial bit clock output from Sti5505
		SDA	I2C bus data
		SDA_DAC	I2C bus data to DAC PCB
		SEL_ACLK1	Select audio clock 1
		SEL_ACLK2	Select audio clock 2
		SERVICE	Control signal of service serial interface
		SICL	Serial interface clock input
		SIDA	Serial interface data input
		SILD	Serial interface load
		SINPH	Position control sledge in
		SL	Sledge actuator control signal from servo processor to power driver
		SL-	Sledge actuator negative connection to sledge motor
		SL+	Sledge actuator positive connection to sledge motor
		SPDIF_AV	Digital audio to the A/V PCB
		SPDIF_FUR	Digital audio to the FURORE
		SPDIF_OUT	Digital output from Sti5505
		SSM_ACT	Indication new frame is being transmitted
		ST_CLK	STI5505 system clock
		ST_TDI	Boundary scan test data input to Sti5505
		STB_CONT	Standby control signal to power supply
		STB_CONTD	Delayed standby control signal - enable or disable the clocks
		STB_MUTE	Standby control signal mute
		STB_OUT	Standby control signal to DAC PCB
		STBY	Standby
		SUR	Servo Unit Ready to accept data (S2B0)
		T{3:1}	Tacho control signals from HD61 to turntable motor driver
		TCK	Boundary scan test clock
		TDI	Boundary scan test data input
		TDO	Boundary scan test data output
		TMS	Boundary scan test mode select
		TRAY1	Tray motor control signal 1 from servo processor to power driver

TRAY2	Tray motor control signal 2 from servo processor to power driver
TRAYSW	Tray switch control signal to servo processor
TRST	Boundary scan test port reset
TXD_BE	Transmitted data basic engine serial interface (S2B)
TXD_SER	Transmitted data service serial interface
VCC_FUR	Filtered power supply 3V3 to FUIORE IC
VCC_LVC00	Filtered power supply 3V3 to IC7400
VCC3V3	Power supply 3V3
VCCSV	Power supply 5V to system clocks
VDD_DRAM	Power supply for DRAM 7450 (option)
VDD_MEM	Power supply for flashes 7401 and 7451
VDD_MEM2	Power supply for SDRAM
VDD_STI	Power supply for ST5505
VDDA_ADC	ADC power supply voltage 3V3 for FUIORE
VDDA_AGC	AGC power supply voltage 3V3 for FUIORE
VO2-	Tray motor negative connection
VO2+	Tray motor positive connection
V-REF	Reference voltage
VSYNC	Vertical synchronisation
-VVID	Negative reference voltage to video buffers
WAIT	Wait state request
WE	Servo flash Write Enable
WEN	Write enable control signal to SDRAM
WRI	Write enable input of HD61 (Servo)
Y_OUT	Luminance output from STi5505
Y_VID	Buffered luminance output to A/V board

10. Spare parts list

Mechanical		
Various		
0001	3104 127 11490	FRONT AL ASSY
0002	3104 127 12140	FRONT ASSY
0004	3104 127 12880	WINDOW ASSY
0006	3104 127 12150	HOLDER RIGHT COMPLETE
0007	3104 127 12270	POWER ON/OFF KNOB ASSY
0010	3104 124 05450	LIGHT CONDUCTOR
0012	3104 127 12160	HOLDER LEFT ASSY
0050	3104 120 00260	SA-CD BADGE
0065	3104 127 11520	TRAY FRONT COMPLETE SA-CD1000
0075	3104 118 90180	TAPTITE SCREW TORX + SPIKES
0076	3104 118 90180	TAPTITE SCREW TORX + SPIKES
0077	3104 118 90180	TAPTITE SCREW TORX + SPIKES
0078	3104 118 90180	TAPTITE SCREW TORX + SPIKES
0081	9305 023 61101	
0086	3104 126 25210	DUST CAP
0151	3104 127 11930	COVER ASSY
0251	3104 127 10740	FOOT SILVER ASSY
0252	3104 127 10740	FOOT SILVER ASSY
0253	3104 127 10740	FOOT SILVER ASSY
0254	3104 127 10740	FOOT SILVER ASSY
0301	3104 128 92900	MAINSORD EU CLASS 1 NO GROUND
0309	3104 125 23810	USER MANUAL SACD EU (7-LANG)
0316	3104 128 92490	VIDEO CORD SET GOLD PLATED
0318	3104 207 10850	IRT PROD ASSY RC2055/01 PACKED
0320	4822 321 22611	
0321	4822 321 22611	
0322	4822 321 22611	
0323	4822 321 22611	
0324	4822 321 61452	
0325	4822 321 61847	SCART
1002	3104 128 06870	MONOBOARD 4285 ASSY SACD1000
1003	3104 128 06890	A/V BOARD 4225 MOVIE SACD1000
1004	3104 129 22150	PSU SACD1000
1007	3104 128 70230	SRV1122WW MITSUMI TRAFO ASSY SACD
8003	3104 157 11860	CWAS FLEX SACD 24 108 32S
8006	3104 157 11190	CWAS FLEX DVD 22 130 32S
8007	3104 157 11200	CWAS FLEX DVD 16 130 32S
Front part		
Various		
3104 127 12270	POWER ON/OFF KNOB ASSY	
VAL6011		
Various		
9305 167 60065	GENEVA LP LOADER ASSY	
9305 022 60101	VAM6001/01	
00003	3139 194 00710	SUSPENSION
00004	3139 194 00710	SUSPENSION
00005	3139 194 00620	SUSPENSION
00006	3139 194 00620	SUSPENSION
00007	3139 197 60060	CLAMPER ASSEMBLY

Loader	
Various	
0004	4822 358 10266
0009	3139 198 80010
0010	4822 532 13097
0011	3139 194 00270
0012	3139 197 50060
TULE	
PCS PWB	
Various	
1001	4822 130 11531
SENSOR LT125A	
DAC PWB	
Various	
1001	3104 128 06960
1002	3104 128 06970
MJ1 DAC BOARD SACD MJ1 POWER SUPPLY SACD	
Linear PSU	
Various	
031L	9965 000 06670
M1698-A NEJI TERMINAL	
-I-	
C101	9965 000 06694
C102	4822 121 70437
C103	9965 000 05891
APSV 471J 470pF (TP) 100V PP	
C104	4822 126 10513
C105	5322 126 10511
C111	4822 124 22038
C112	4822 124 22039
C151	9965 000 06694
C152	4822 121 70437
C153	9965 000 05891
APSV 471J 470pF (TP) 100V PP	
C154	4822 126 10513
C155	5322 126 10511
C161	4822 124 22039
C162	4822 124 22039
C201	9965 000 06694
C202	4822 121 70437
C203	9965 000 05891
APSV 471J 470pF (TP) 100V PP	
C204	4822 126 10513
C205	5322 126 10511
C211	4822 124 22039
C212	4822 124 22039
C251	9965 000 06694
C252	4822 121 70437
C253	9965 000 05891
APSV 471J 470pF (TP) 100V PP	
C254	4822 126 10513
C255	5322 126 10511
C261	4822 124 22039
C262	4822 124 22039
C301	9965 000 06697
C302	9965 000 03406
C303	4822 126 10513
C317	9965 000 06697
C318	5322 126 10511
C321	4822 124 22039
C322	4822 124 22039
C351	9965 000 06697
C352	9965 000 03406
C353	4822 126 10513
C367	9965 000 06697
C368	5322 126 10511
C371	4822 124 22039
C372	4822 124 22039
C401	9965 000 06697
C402	9965 000 03406
C403	4822 126 10513
C417	9965 000 06697
560pF J 100V APSV	

C418	5322 126 10511	1nF 5% 50V
C421	4822 124 22039	1220 µF 16V
C422	4822 124 22039	1220 µF 16V
C451	9965 000 06697	560pF J 100V APSV
C452	9965 000 03406	150pF J 100V APSV
C453	4822 126 10513	47pF 5% 50V
C467	9965 000 06697	560pF J 100V APSV
C468	5322 126 10511	1nF 5% 50V
C471	4822 124 22039	1220 µF 16V
C472	4822 124 22039	1220 µF 16V
C501	9965 000 06697	560pF J 100V APSV
C502	9965 000 03406	150pF J 100V APSV
C503	4822 126 10513	47pF 5% 50V
C517	9965 000 06697	560pF J 100V APSV
C518	5322 126 10511	1nF 5% 50V
C521	4822 124 22039	1220 µF 16V
C522	4822 124 22039	1220 µF 16V
C551	9965 000 06697	560pF J 100V APSV
C552	9965 000 03406	150pF J 100V APSV
C553	4822 126 10513	47pF 5% 50V
C567	9965 000 06697	560pF J 100V APSV
C568	5322 126 10511	1nF 5% 50V
C571	4822 124 22039	1220 µF 16V
C572	4822 124 22039	1220 µF 16V
C601	4822 124 80123	220µF 16V
C602	4822 124 80123	220µF 16V
C603	9965 000 01344	100pF 100V ECQ-P1101JZ
C611	4822 124 80123	220µF 16V
C612	4822 124 80123	220µF 16V
C613	9965 000 01344	100pF 100V ECQ-P1101JZ
C621	4822 124 80123	220µF 16V
C622	4822 124 80123	220µF 16V
C623	9965 000 01344	100pF 100V ECQ-P1101JZ
C631	4822 124 80123	220µF 16V
C632	4822 124 80123	220µF 16V
C633	9965 000 01344	100pF 100V ECQ-P1101JZ
C641	4822 124 80123	220µF 16V
C642	4822 124 80123	220µF 16V
C643	9965 000 01344	100pF 100V ECQ-P1101JZ
C651	4822 124 80123	220µF 16V
C652	4822 124 80123	220µF 16V
C653	9965 000 01344	100pF 100V ECQ-P1101JZ
C701	9965 000 06694	1800pF J 100V APSV
C702	4822 121 70437	1nF 5%
C703	9965 000 05891	APSV 471J 470pF (TP) 100V PP
C704	4822 126 10513	47pF 5% 50V
C705	5322 126 10511	1nF 5% 50V
C711	4822 124 22039	1220 µF 16V
C712	4822 124 22039	1220 µF 16V
C751	9965 000 06694	1800pF J 100V APSV
C752	4822 121 70437	1nF 5%
C753	9965 000 05891	APSV 471J 470pF (TP) 100V PP
C754	4822 126 10513	47pF 5% 50V
C755	5322 126 10511	1nF 5% 50V
C761	4822 124 22039	1220 µF 16V
C762	4822 124 22039	1220 µF 16V
C801	4822 122 40617	0.1µF 50V
C802	4822 122 40617	0.1µF 50V
C803	4822 124 41458	4700µF 20% 16V
C804	4822 122 40617	0.1µF 50V
C805	4822 124 22039	1220 µF 16V
C806	4822 124 41458	4700µF 20% 16V
C814	4822 122 40617	0.1µF 50V
C815	4822 124 12404	220µF 20% 16V
C816	4822 122 40617	0.1µF 50V
C817	4822 124 90353	100 µF 10V
C818	4822 122 40617	0.1µF 50V
C821	4822 122 40617	0.1µF 50V
C822	4822 122 40617	0.1µF 50V
C823	9965 000 06700	1000µF 25V
C824	9965 000 06700	1000µF 25V
C825	9965 000 06700	1000µF 25V
C826	9965 000 06700	1000µF 25V
C827	4822 124 41535	1000µF 25V
C828	4822 124 41535	1000µF 25V
C829	4822 124 81144	1000µF 16V
C830	4822 124 81144	1000µF 16V
C841	4822 122 40617	0.1µF 50V
C842	4822 122 40617	0.1µF 50V
C843	4822 124 22723	1000µF 25V
C844	4822 122 40617	0.1µF 50V
C845	4822 124 12404	220µF 20% 16V
C846	4822 122 40617	0.1µF 50V
C851	4822 126 11703	0.01µF
C852	4822 126 11703	0.01µF
C853	4822 126 11703	0.01µF
C854	4822 126 11703	0.01µF

CD01	4822 124 41539	47µF 16V
CD02	4822 126 11687	
CD03	4822 122 33761	22pF 5% 50V
CD04	4822 122 33753	22pF 5% 50V
CD05	4822 126 11687	
CD06	4822 126 11687	
CD07	4822 126 11687	
CD08	9965 000 06692	20pF +5% CH 50V
CD09	4822 126 11687	
CD11	4822 122 33753	150pF 5% 50V
CD12	4822 122 33753	150pF 5% 50V
CD17	4822 122 33753	150pF 5% 50V
CD18	4822 122 33753	150pF 5% 50V
CD21	4822 126 11687	
CD23	4822 124 22039	1220 µF 16V
CD24	9965 000 06693	47µF 16V ARA
CD41	4822 124 90353	100 µF 10V
CD42	4822 126 11687	
CD43	9965 000 01567	100 µF 10V ARA
CD44	4822 126 11687	
CD45	4822 126 11687	
CD46	9965 000 01567	100 µF 10V ARA
CD47	4822 126 11687	
CD48	4822 124 11947	10µF 20% 16V
CD49	4822 126 11687	
CD51	4822 124 90353	100 µF 10V
CD52	4822 126 11687	
CD53	9965 000 01567	100 µF 10V ARA
CD54	4822 126 11687	
CD55	4822 126 11687	
CD56	9965 000 01567	100 µF 10V ARA
CD57	4822 126 11687	
CD58	4822 124 11947	10µF 20% 16V
CD59	4822 126 11687	
CD61	4822 124 90353	100 µF 10V
CD62	4822 126 11687	
CD63	9965 000 01567	100 µF 10V ARA
CD64	4822 126 11687	
CD65	4822 126 11687	
CD66	9965 000 01567	100 µF 10V ARA
CD67	4822 126 11687	
CD68	4822 124 11947	10µF 20% 16V
CD69	4822 126 11687	
CD71	4822 126 11687	
CD72	4822 126 11687	
CD91	4822 126 11703	0.01µF
CD92	4822 126 11703	0.01µF
CD93	4822 126 11703	0.01µF
CD94	4822 126 11703	0.01µF
CD95	4822 126 11703	0.01µF
CD96	4822 126 11703	0.01µF
CD101	4822 124 40763	1µF 50V
CD12	4822 124 40763	2.2µF 100 V
CD30	4822 124 23649	470µF 25V
CD31	4822 124 80067	4.7µF 20% 63V
CD22	4822 124 22273	0.47µF 50V
CD23	5322 122 32654	63V 22nF PM10 R



D101	4822 130 32362	MA165
D102	4822 130 81324	1SS302-X
D103	4822 130 81324	1SS302-X
D151	4822 130 32362	MA165
D152	4822 130 81324	1SS302-X
D153	4822 130 81324	1SS302-X
D201	4822 130 32362	MA165
D202	4822 130 81324	1SS302-X
D203	4822 130 81324	1SS302-X
D251	4822 130 32362	MA165
D252	4822 130 81324	1SS302-X
D253	4822 130 81324	1SS302-X
D301	4822 130 32362	MA165
D302	4822 130 81324	1SS302-X
D303	4822 130 81324	1SS302-X
D351	4822 130 32362	MA165
D352	4822 130 81324	1SS302-X
D353	4822 130 81324	1SS302-X
D401	4822 130 32362	MA165
D402	4822 130 81324	1SS302-X
D403	4822 130 81324	1SS302-X
D451	4822 130 32362	MA165
D452	4822 130 81324	1SS302-X
D453	4822 130 81324	1SS302-X
D501	4822 130 32362	MA165
D502	4822 130 81324	1SS302-X
D503	4822 130 81324	1SS302-X
D551	4822 130 81324	1SS302-X
D552	4822 130 81324	1SS302-X
D601	4822 130 32362	MA165
D621	4822 130 32362	MA165
D641	4822 130 32362	MA165

D701	4822 130 32362	MA165
D702	4822 130 81324	1SS302-X
D703	4822 130 81324	1SS302-X
D751	4822 130 32362	MA165
D752	4822 130 81324	1SS302-X
D753	4822 130 81324	1SS302-X
D801	4822 130 82421	1D3
D802	4822 130 82421	1D3
D803	4822 130 82421	1D3
D804	4822 130 82421	1D3
D821	4822 130 82421	1D3
D822	4822 130 82421	1D3
D823	4822 130 82421	1D3
D824	4822 130 82421	1D3
D825	4822 130 80623	MTZ13B
D826	4822 130 80623	MTZ13B
D827	4822 130 32362	MA165
D828	4822 130 32362	MA165
D841	4822 130 82421	1D3
D842	4822 130 82421	1D3
D843	4822 130 82421	1D3
D844	4822 130 82421	1D3
D921	4822 130 83715	1SS301
D923		
OH1	4822 130 82421	1D3
DN01	4822 130 82421	1D3
DN02	4822 130 82421	1D3
DN03	4822 130 82421	1D3
DN04	4822 130 82421	1D3
DN05	4822 130 82421	1D3
DN06	4822 130 32362	MA165
DN07	4822 130 32362	MA165
DN08	4822 130 33948	MTZJ5.6B
DN20	4822 130 83715	1SS301
DN31	4822 130 32362	MA165
DN32	4822 130 32362	MA165
DN33	4822 130 32362	MA165
FB01	4822 070 32001	218.200(200MA)
FB21	4822 070 38001	218.800(800MA)
FB22	4822 070 38001	218.800(800MA)
FB41	4822 070 34001	218.400(400MA)
FB01	9965 000 06705	T1A H 250V SS05
GH0		
5A	9965 000 06706	10NF +20% F AC250V



L601	4822 116 82487	OR00
L602	9965 000 06669	ED2-12NU
L611	4822 116 82487	OR00
L621	4822 116 82487	OR00
L622	9965 000 06669	ED2-12NU
L631	4822 116 82487	OR00
L641	4822 116 82487	OR00
L642	9965 000 06669	ED2-12NU
L651	4822 116 82487	OR00
LD01	4822 158 60654	BLM31A02
LD02	4822 158 60654	BLM31A02
LD41	9965 000 03109	FB M J2125HM330-T
LD51	9965 000 03109	FB M J2125HM330-T
LD61	9965 000 03109	FB M J2125HM330-T
LH01	4822 157 70398	
LH02	4822 280 80754	VS-12MB
LN31	9965 000 06669	ED2-12NU
LN32	9965 000 06669	ED2-12NU
LN33	9965 000 06669	ED2-12NU



Q101	4822 130 42843	2SK389
Q102	4822 130 61425	2SC2873
Q103	4822 130 63928	2SA1312(B)
Q104	4822 130 63928	2SA1312(B)
Q105	4822 130 63929	2SC3324(B)
Q106	5322 130 41844	2SK170BL
Q107	4822 130 62649	2SJ74
Q151	4822 130 42843	2SK389
Q152	4822 130 61425	2SC2873
Q153	4822 130 63928	2SA1312(B)
Q154	4822 130 63928	2SA1312(B)
Q155	4822 130 63929	2SC3324(B)
Q156	5322 130 41844	2SK170BL
Q157	4822 130 62649	2SJ74
Q201	4822 130 42843	2SK389
Q202	4822 130 61425	2SC2873
Q203	4822 130 63928	2SA1312(B)
Q204	4822 130 63928	2SA1312(B)
Q205	4822 130 63929	2SC3324(B)
Q206	5322 130 41844	2SK170BL
Q207	4822 130 62649	2SJ74
Q251	4822 130 42843	2SK389

Q252	4822 130 61425	2SC2873
Q253	4822 130 63928	2SA1312(B)
Q254	4822 130 63928	2SA1312(B)
Q255	4822 130 63929	2SC3324(B)
Q256	5322 130 41844	2SK170BL
Q257	4822 130 62649	2SJ74
Q301	4822 130 42843	2SK389
Q302	4822 130 61425	2SC2873
Q303	4822 130 63928	2SA1312(B)
Q304	4822 130 63928	2SA1312(B)
Q305	4822 130 63929	2SC3324(B)
Q306	5322 130 41844	2SK170BL
Q307	4822 130 62649	2SJ74
Q351	4822 130 42843	2SK389
Q352	4822 130 61425	2SC2873
Q353	4822 130 63928	2SA1312(B)
Q354	4822 130 63928	2SA1312(B)
Q355	4822 130 63929	2SC3324(B)
Q356	5322 130 41844	2SK170BL
Q357	4822 130 62649	2SJ74
Q401	4822 130 42843	2SK389
Q402	4822 130 61425	2SC2873
Q403	4822 130 63928	2SA1312(B)
Q404	4822 130 63928	2SA1312(B)
Q405	4822 130 63929	2SC3324(B)
Q406	5322 130 41844	2SK170BL
Q407	4822 130 62649	2SJ74
Q451	4822 130 42843	2SK389
Q452	4822 130 61425	2SC2873
Q453	4822 130 63928	2SA1312(B)
Q454	4822 130 63928	2SA1312(B)
Q455	4822 130 63929	2SC3324(B)
Q456	5322 130 41844	2SK170BL
Q457	4822 130 62649	2SJ74
Q501	4822 130 42843	2SK389
Q502	4822 130 61425	2SC2873
Q503	4822 130 63928	2SA1312(B)
Q504	4822 130 63928	2SA1312(B)
Q505	4822 130 63929	2SC3324(B)
Q506	5322 130 41844	2SK170BL
Q507	4822 130 62649	2SJ74
Q551	4822 130 42843	2SK389
Q552	4822 130 61425	2SC2873
Q553	4822 130 63928	2SA1312(B)
Q554	4822 130 63928	2SA1312(B)
Q555	4822 130 63929	2SC3324(B)
Q556	5322 130 41844	2SK170BL
Q557	4822 130 62649	2SJ74
Q701	4822 130 42843	2SK389
Q702	4822 130 61425	2SC2873
Q703	4822 130 63928	2SA1312(B)
Q704	4822 130 63928	2SA1312(B)
Q705	4822 130 63929	2SC3324(B)
Q706	5322 130 41844	2SK170BL
Q707	4822 130 62649	2SJ74
Q751	4822 130 42843	2SK389
Q752	4822 130 61425	2SC2873
Q753	4822 130 63928	2SA1312(B)
Q754	4822 130 63928	2SA1312(B)
Q755	4822 130 63929	2SC3324(B)
Q756	5322 130 41844	2SK170BL
Q757	4822 130 62649	2SJ74
Q801	9965 000 06702	PO15RW11 3.0 15V
		VARIABLE REG.
Q811	4822 209 73096	NJM78M05FA
Q812	9965 000 03397	BA003FP 3.3V 1A PD=1W
		VD=0.3V
Q821	4822 130 62704	VS81225
Q822	5322 130 41842	BDW93B
Q841	4822 209 82828	NJM78M12A
Q901		
Q902	9965 000 06673	TC7WHU04FU
Q903		
Q904	9965 000 04632	IC TC74VHC00FT
Q905		
Q906	9965 000 04632	IC TC74VHC00FT
Q907		
Q908		
Q909		
Q910	4822 130 61541	2SC4116(G)
Q911		
Q912	4822 130 42843	2SK389
Q913		
Q914	9965 000 06674	TC7WH74FU
Q915		
Q916	9965 000 06673	TC7WHU04FU
Q917		
Q918	5322 209 11578	PCF8574T
Q919		
Q920	4822 130 61541	2SC4116(G)
Q921		
Q922	9965 000 03397	BA033FP 3.3V 1A PD=1W
Q923		
Q924	4822 130 63928	2SA1312(B)
Q925		
Q926	4822 130 61541	2SC4116(G)
Q927		
Q928	4822 130 61541	2SC4116(G)
Q929		
Q930	9965 000 06675	CS4397 24BIT 192KHZ
Q931		
Q932		
Q933		
Q934		
Q935		
Q936		
Q937		
Q938		
Q939		
Q940		
Q941		
Q942		
Q943		
Q944		
Q945		
Q946		
Q947		
Q948		
Q949		
Q950		
Q951		
Q952		
Q953		
Q954		
Q955		
Q956		
Q957		
Q958		
Q959		
Q960		
Q961		
Q962		
Q963		
Q964		
Q965		
Q966		
Q967		
Q968		
Q969		
Q970		

GB 158			10.	SACD 1000		Spare parts list		Spare parts list		SACD 1000	10.	GB 159			
RD54	9965 000 06688	3.24k Q +1% 1/10W		2374	4822 126 14076	220nF 25V. PB020	3313	4822 051 20391	390Q 5% 0.1W	6303	4822 130 83757	BAS216	2106	4822 124 81286	47uF 20% 16V
RD55	9965 000 06689	2.21k Q +1% 1/10W		2375	4822 122 33575	220pF 5% 63V CASE	3314	4822 051 10102	1k 2% 0.25W	6306	9322 154 46685	DIO REC SM RB501V-40 (RHM0) R	2107	4822 126 12105	50V 33nF PM5
RD56	4822 051 30102	1k 5% 0.062W		2376	4822 124 40248	10uF 20% 63V	3315	4822 051 20471	470Q 5% 0.1W	6307	9322 154 46685	DIO REC SM RB501V-40 (RHM0) R	2108	4822 126 12105	50V 33nF PM5
RD61	4822 051 30223	22k 5% 0.062W		2377	4822 122 33575	220pF 5% 63V CASE	3316	4822 117 10834	47k 1% 0.1W	6308	9322 154 46685	DIO REC SM RB501V-40 (RHM0) R	2109	4822 126 12105	50V 33nF PM5
RD62	4822 116 82487	0Q		2378	4822 124 40769	4.7uF 20% 100V	3318	4822 117 10834	47k 1% 0.1W	6309	4822 130 11383	BZ284-C5V1	2110	4822 126 12105	50V 33nF PM5
RD63	4822 051 30223	22k 5% 0.062W		2379	4822 126 14585	100nF 10% 50V	3319	4822 051 10102	1k 2% 0.25W	6400	4822 130 10845	GP1F32T	2111	4822 126 12105	50V 33nF PM5
RD64	9965 000 06688	3.24k Q +1% 1/10W		2380	4822 126 14585	100nF 10% 50V	3320	4822 117 10834	47k 1% 0.1W				2114	5322 122 32658	22pF 5% 50V
RD65	9965 000 06689	2.21k Q +1% 1/10W		2381	4822 126 14585	100nF 10% 50V	3321	4822 051 20101	100Q 5% 0.1W				2115	5322 122 32658	22pF 5% 50V
RD66	4822 051 30102	1k 5% 0.062W		2382	4822 124 40769	4.7uF 20% 100V	3322	4822 051 20101	100Q 5% 0.1W				2116	4822 126 12105	50V 33nF PM5
RD71	4822 051 30223	22k 5% 0.062W		2383	4822 124 40769	4.7uF 20% 100V	3323	4822 051 20471	470Q 5% 0.1W				2117	4822 124 81286	47uF 20% 16V
RD72	4822 051 30223	22k 5% 0.062W		2384	4822 126 14585	470nF 10% 16V XTR	3325	4822 117 10834	47k 1% 0.1W				2118	5322 122 32658	22pF 5% 50V
RD73	4822 051 30223	22k 5% 0.062W		2385	4822 124 40769	4.7uF 20% 100V	3327	4822 117 11927	75Q 1% 0.1W				2121	5322 122 32658	22pF 5% 50V
RD74	4822 051 30223	22k 5% 0.062W		2386	4822 126 14583	470nF 10% 16V XTR	3329	4822 051 20471	470Q 5% 0.1W				2122	4822 126 12105	50V 33nF PM5
RD75	4822 051 30223	22k 5% 0.062W		2387	4822 126 14583	470nF 10% 16V XTR	3330	4822 117 11927	75Q 1% 0.1W				2123	4822 124 81286	47uF 20% 16V
RD76	4822 051 30101	100Q 5% 0.062W		2388	4822 126 14076	220nF 25V. PB020	3331	4822 117 11145	4k 7% 0.1W				2124	3198 028 52290	22uF 20% 50V
RD77	4822 051 30223	22k 5% 0.062W		2389	4822 126 14583	470nF 10% 16V XTR	3332	4822 051 20471	470Q 5% 0.1W				2125	5322 122 32658	22pF 5% 50V
RD78	4822 051 30102	1k 5% 0.062W		2390	4822 122 33177	10nF 20% 50V	3333	4822 117 10353	150Q 1% 0.1W				2126	4822 124 11947	10uF 20% 16V
RD79	4822 117 12139	22Q 5% 0.062W		2391	4822 122 33177	10nF 20% 50V	3334	4822 117 10357	4k 3% 0.2W				2127	4822 126 12105	50V 33nF PM5
RD80	4822 117 12891	220k 1% ERJ3Q		2392	4822 126 14583	470nF 10% 16V XTR	3335	4822 051 20471	470Q 5% 0.1W				2128	5322 122 31647	1nF 10% 63V
RD81	4822 051 30223	22k 5% 0.062W		2393	4822 122 33177	10nF 20% 50V	3336	4822 117 11927	75Q 1% 0.1W				2129	3198 028 52290	22uF 20% 50V
RD82	4822 051 30223	22k 5% 0.062W		2394	4822 126 14076	220nF 25V. PB020	3338	4822 117 10833	10k 1% 0.1W				2130	3198 028 52290	22uF 20% 50V
RD83	4822 051 30223	22k 5% 0.062W		2395	4822 122 33575	220pF 5% 63V CASE	3339	4822 051 20101	100Q 5% 0.1W				2131	3198 028 52290	22uF 20% 50V
RD84	4822 051 30223	22k 5% 0.062W		2396	4822 124 40248	10uF 20% 63V	3340	4822 051 20101	100Q 5% 0.1W						
RD85	4822 051 30223	22k 5% 0.062W		2397	4822 122 33177	10nF 20% 50V	3341	4822 117 10833	10k 1% 0.1W						
RD86	4822 051 30101	100Q 5% 0.062W		2398	4822 122 33177	10nF 20% 50V	3342	4822 051 20471	470Q 5% 0.1W						
RD87	4822 051 30223	22k 5% 0.062W		2399	4822 124 40248	10uF 20% 63V	3343	4822 117 11927	75Q 1% 0.1W						
RD88	4822 051 30223	22k 5% 0.062W		2400	4822 122 33177	10nF 20% 50V	3345	4822 117 11927	75Q 1% 0.1W						
RD89	4822 117 12139	22Q 5% 0.062W		2401	4822 126 14583	470nF 10% 16V XTR	3347	4822 051 20471	470Q 5% 0.1W						
RD90	4822 117 12891	220k 1% ERJ3Q		2402	4822 122 33575	220pF 5% 63V CASE	3348	4822 051 10102	1k 2% 0.25W						
RN01	4822 051 30102	1k 5% 0.062W		2403	4822 126 14076	220nF 25V. PB020	3349	4822 117 10834	47k 1% 0.1W						
RN02	9965 000 06689	3.9M Q +5% 1/16W		2404	4822 122 33575	220pF 5% 63V CASE	3350	4822 117 10833	10k 1% 0.1W						
RN03	4822 116 83819	18k 5% 0.063W		2405	4822 126 13692	47pF 1% 63V	3351	4822 051 20471	470Q 5% 0.1W						
RN04	4822 117 12925	47k 1% 0.063W 0603		2406	4822 126 13692	47pF 1% 63V	3352	4822 051 20562	5k 6% 0.1W 0805						
RN05	4822 051 30103	10k 5% 0.062W		2407	4822 126 14583	470nF 10% 16V XTR	3353	4822 051 10102	1k 2% 0.25W						
RN06	4822 051 30222	2k 5% 0.062W		2408	4822 122 33575	220pF 5% 63V CASE	3354	4822 117 11927	75Q 1% 0.1W						
RN07	4822 051 30103	10k 5% 0.062W		2409	4822 122 33575	220pF 5% 63V CASE	3355	4822 051 20339	33Q 5% 0.1W						
RN08	4822 051 30472	4k 7% 0.062W		2410	4822 122 33575	220pF 5% 63V CASE	3356	4822 051 20472	4k 7% 0.1W						
RN09	4822 051 30472	4k 7% 0.062W		2411	4822 124 40248	10uF 20% 63V	3357	4822 051 20472	4k 7% 0.1W						
RN10	4822 051 30223	22k 5% 0.062W		2412	4822 124 40433	47uF 20% 25V	3358	4822 117 10834	47k 1% 0.1W						
RN11	4822 051 30332	3k 3% 0.062W		2413	5322 122 32654	63V 22nF PM10 R	3359	4822 051 20471	470Q 5% 0.1W						
RN22	4822 051 30332	3k 3% 0.062W		2414	5322 122 32531	100pF 5% 50V	3362	4822 051 20471	470Q 5% 0.1W						
RN23	4822 117 13632	100k 1% 0603 0.62W		2415	4822 124 40248	10uF 20% 63V	3363	4822 051 10102	1k 2% 0.25W						
RN24	4822 117 12925	47k 1% 0.063W 0603		2416	4822 126 14585	100nF 10% 50V	3364	4822 117 11148	56k 1% 0.1W						
RN25	4822 051 30333	33k 5% 0.062W		2417	4822 126 14585	100nF 10% 50V	3365	4822 051 20561	56Q 5% 0.1W						
RN26	4822 051 30103	10k 5% 0.062W		2418	4822 126 14583	470nF 10% 16V XTR	3366	4822 117 10834	47k 1% 0.1W						
RN27	4822 117 13632	100k 1% 0603 0.62W		2419	4822 124 40433	47uF 20% 25V	3367	4822 117 12955	2k 7% 0.1W 0805						
SD71	9965 000 06676	SLIDE SW. SSSF113-S06N1		2450	5322 122 32654	63V 22nF PM10 R	3368	4822 117 12955	2k 7% 0.1W 0805						
SH02A	4822 277 21825	SW 115/220V		2452	4822 126 14076	220nF 25V. PB020	3378	4822 051 10102	1k 2% 0.25W						
XD01	9965 000 06677	16.9344MHz UM-5		2453	4822 124 40433	47uF 20% 25V	3394	4822 051 20471	470Q 5% 0.1W						
				2455	5322 122 32531	100pF 5% 50V	3395	4822 051 20472	4k 7% 0.1W						
				2456	4822 124 22339	100UE 16V	3397	4822 117 10834	47k 1% 0.1W						
				2457	5322 126 10511	1nF 5% 50V	3398	4822 051 20472	4k 7% 0.1W						
				2458	5322 122 32654	63V 22nF PM10 R	3399	4822 051 20562	5k 6% 0.1W 0805						
				2459	5322 122 32531	100pF 5% 50V	3400	4822 117 11927	75Q 1% 0.1W						
				2460	5322 122 32654	63V 22nF PM10 R	3401	4822 117 11927	75Q 1% 0.1W						
				2461	5322 122 32531	100pF 5% 50V	3402	4822 051 20472	4k 7% 0.1W						
				2462	4822 124 22339	100UE 16V	3403	4822 117 11927	75Q 1% 0.1W						
				2463	5322 126 10511	1nF 5% 50V	3404	4822 117 11927	75Q 1% 0.1W						
				2464	5322 122 32531	100pF 5% 50V	3405	4822 117 11927	75Q 1% 0.1W						
				2465	5322 122 32654	63V 22nF PM10 R	3406	4822 117 11927	75Q 1% 0.1W						
				2468	5322 122 32654	63V 22nF PM10 R	3407	4822 117 11927	75Q 1% 0.1W						
				2469	5322 122 32654	63V 22nF PM10 R	3408	4822 117 11927	75Q 1% 0.1W						
				2470	5322 122 32654	63V 22nF PM10 R	3409	4822 051 20471	470Q 5% 0.1W						
				2471	4822 126 14585	100nF 10% 50V	3410	4822 051 20471	470Q 5% 0.1W						
				2472	4822 124 40433	47uF 20% 25V	3411	4822 117 11927	75Q 1% 0.1W						
				2473	5322 122 32654	63V 22nF PM10 R	3413	4822 117 10834	47k 1% 0.1W						
				2474	4822 124 40433	47uF 20% 25V	3414	4822 051 20472	4k 7% 0.1W						
				2475	4822 124 40433	47uF 20% 25V	3415	4822 051 20223	22k 5% 0.1W						
				2476	4822 124 22339	100UE 16V	3416	4822 051 20339	33Q 5% 0.1W						
				2477	5322 122 32654	63V 22nF PM10 R	3418	4822 051 20471	470Q 5% 0.1W						
				2480	5322 122 32531	100pF 5% 50V	3419	4822 051 20101	100Q 5% 0.1W						

7112 4822 209 31257 MC79L24ACP

Mono PWB

Various

1001	2422 025 18957	CON BM V 24P F 1.00 FFC 0.3 R
1104	2422 025 15963	CON BM H 24P F 0.50 FFC SMD R
1106	2422 025 16158	CON BM H 8P F 1.00 FFC 0.3 R
1205	2422 540 98428	RST CER SM 8M467 CSTC6.04MHz R
1300	2422 540 98426	RST CER SM 6MHz CSTC6.00MHz R
1301	4822 267 51454	CONN. 11P FEMALE
1603	2422 025 16389	CON BM V 22P F 1.00 FFC 0.3 R
1604	2422 025 16388	CON BM V 16P F 1.00 FFC 0.3 R

-II-

2009	4822 126 14305	100nF 10% 16V 0603
2010	4822 126 14305	100nF 10% 16V 0603
2011	4822 126 14305	100nF 10% 16V 0603
2012	4822 126 14305	100nF 10% 16V 0603
2013	4822 126 14043	1uF 20% 16V CASE
2100	2222 780 15656	1uF 330F PM10 R
2101	4822 126 14305	100nF 10% 16V 0603
2103	4822 124 80151	47uF 16V
2104	4822 126 13193	4.7nF 10% 63V
2105	4822 122 33761	22pF 5% 50V
2107	4822 126 13956	68pF 5% 63V CASE 0603
2108	4822 126 14315	390pF 5% 50V 0603
2109	2020 552 95627	
2110	2222 861 15222	63V 2N2 PMS
2111	4822 126 14305	100nF 10% 16V 0603
2112	5322 126 11578	1nF 10% 50V 0603
2113	4822 126 14305	100nF 10% 16V 0603
2114	4822 122 31765	100pF 2% 63V
2115	4822 126 14305	100nF 10% 16V 0603
2116	4822 126 14305	100nF 10% 16V 0603
2117	4822 126 14305	100nF 10% 16V 0603
2118	3198 017 42230	0603 50V 22nF COL
2119	3198 017 42230	0603 50V 22nF COL
2120	4822 126 14305	100nF 10% 16V 0603
2121	4822 126 13879	220nF 20% 16V
2122	3198 017 42230	0603 50V 22nF COL
2123	4822 126 14305	100nF 10% 16V 0603
2124	4822 126 14305	100nF 10% 16V 0603
2125	4822 126 14305	100nF 10% 16V 0603
2126	4822 126 14305	100nF 10% 16V 0603
2127	4822 126 14305	100nF 10% 16V 0603
2128	4822 126 14508	180pF 5% 50V 0603
2129	4822 126 14508	180pF 5% 50V 0603
2130	4822 122 33761	22pF 5% 50V
2131	4822 126 14494	22nF 10% 25V 0603
2136	4822 126 14305	100nF 10% 16V 0603
2137	4822 126 14305	100nF 10% 16V 0603
2138	4822 126 14305	100nF 10% 16V 0603
2139	4822 126 14305	100nF 10% 16V 0603
2140	4822 126 14241	0603 50V 330P COL R
2141	4822 122 33761	22pF 5% 50V
2142	5322 126 11583	10nF 10% 50V 0603
2143	4822 126 13883	220pF 5% 50V
2144	4822 126 13883	220pF 5% 50V
2145	4822 126 13883	220pF 5% 50V
2146	4822 126 14305	100nF 10% 16V 0603
2147	4822 126 14305	100nF 10% 16V 0603
2200	4822 126 14494	22nF 10% 25V 0603
2201	4822 126 14494	22nF 10% 25V 0603
2202	4822 126 14494	22nF 10% 25V 0603
2203	4822 126 14305	100nF 10% 16V 0603
2204	4822 126 14305	100nF 10% 16V 0603
2205	4822 126 14305	100nF 10% 16V 0603
2206	4822 126 14549	33nF 16V 0603
2207	5322 126 11578	1nF 10% 50V 0603
2208	4822 126 14305	100nF 10% 16V 0603
2209	4822 126 14305	100nF 10% 16V 0603
2210	5322 126 11578	1nF 10% 50V 0603
2212	4822 126 14305	100nF 10% 16V 0603
2213	4822 126 14305	100nF 10% 16V 0603
2214	3198 017 42230	0603 50V 22nF COL
2215	4822 126 14305	100nF 10% 16V 0603
2216	5322 126 11578	1nF 10% 50V 0603
2226	4822 126 14305	100nF 10% 16V 0603
2227	4822 126 14305	100nF 10% 16V 0603
2228	4822 126 14305	100nF 10% 16V 0603
2300	4822 126 14305	100nF 10% 16V 0603

2301	4822 126 14305	100nF 10% 16V 0603
2302	4822 126 14305	100nF 10% 16V 0603
2303	4822 124 80349	47uF 20% 6.3V
2304	3198 017 42230	0603 50V 22nF COL
2305	3198 017 42230	0603 50V 22nF COL
2306	4822 124 23002	10uF 16V
2307	3198 017 42230	0603 50V 22nF COL
2308	4822 126 14494	22nF 10% 25V 0603
2309	4822 126 14305	100nF 10% 16V 0603
2310	4822 126 14305	100nF 10% 16V 0603
2314	4822 126 14305	100nF 10% 16V 0603
2315	4822 126 14305	100nF 10% 16V 0603
2316	4822 126 14494	22nF 10% 25V 0603
2317	4822 126 14494	22nF 10% 25V 0603
2318	5322 122 33861	120pF 10% 50V
2319	4822 126 11569	27nF
2320	4822 126 14494	22nF 10% 25V 0603
2401	4822 126 14305	100nF 10% 16V 0603
2402	4822 126 14305	100nF 10% 16V 0603
2403	4822 126 14305	100nF 10% 16V 0603
2404	4822 126 14305	100nF 10% 16V 0603
2405	4822 126 14305	100nF 10% 16V 0603
2406	4822 126 14305	100nF 10% 16V 0603
2407	4822 126 14305	100nF 10% 16V 0603
2408	4822 126 14305	100nF 10% 16V 0603
2409	4822 126 14305	100nF 10% 16V 0603
2410	4822 126 14305	100nF 10% 16V 0603
2411	4822 126 14305	100nF 10% 16V 0603
2412	4822 126 14305	100nF 10% 16V 0603
2413	4822 126 14305	100nF 10% 16V 0603
2414	4822 126 14305	100nF 10% 16V 0603
2418	4822 124 12095	100uF 20% 16V
2419	4822 124 80349	47uF 20% 6.3V
2420	4822 124 80349	47uF 20% 6.3V
2452	4822 126 14305	100nF 10% 16V 0603
2454	4822 126 14305	100nF 10% 16V 0603
2455	4822 126 14305	100nF 10% 16V 0603
2457	4822 124 23002	10uF 16V
2458	4822 126 14305	100nF 10% 16V 0603
2459	4822 126 14583	470nF 10% 16V XTR
2480	4822 126 14043	1uF 20% 16V CASE
2481	4822 126 14583	470nF 10% 16V XTR
2500	4822 126 14305	100nF 10% 16V 0603
2504	4822 126 14305	100nF 10% 16V 0603
2505	4822 126 14494	22nF 10% 25V 0603
2506	4822 124 3002	10uF 16V
2507	4822 126 14305	100nF 10% 16V 0603
2508	5322 126 11579	3.3nF 10% 63V
2509	4822 126 14241	0603 50V 330P COL R
2510	4822 126 14305	100nF 10% 16V 0603
2511	4822 126 14305	100nF 10% 16V 0603
2512	4822 126 14305	100nF 10% 16V 0603
2513	4822 126 14305	100nF 10% 16V 0603
2514	4822 126 14305	100nF 10% 16V 0603
2515	4822 126 14305	100nF 10% 16V 0603
2516	4822 126 14305	100nF 10% 16V 0603
2517	4822 126 14305	100nF 10% 16V 0603
2518	4822 126 14305	100nF 10% 16V 0603
2519	4822 126 14305	100nF 10% 16V 0603
2520	4822 126 14305	100nF 10% 16V 0603
2521	4822 126 14305	100nF 10% 16V 0603
2522	4822 126 14305	100nF 10% 16V 0603
2523	4822 126 14305	100nF 10% 16V 0603
2524	4822 126 14305	100nF 10% 16V 0603
2525	4822 126 14305	100nF 10% 16V 0603
2526	4822 126 14305	100nF 10% 16V 0603
2528	4822 126 14305	100nF 10% 16V 0603
2529	4822 126 14305	100nF 10% 16V 0603
2530	3198 030 74780	EL SM 35V 4U7 PM20 COL R
2531	3198 030 74780	EL SM 35V 4U7 PM20 COL R
2532	4822 122 33777	47pF 5% 63V
2533	4822 122 33777	47pF 5% 63V
2534	5322 126 11578	1nF 10% 50V 0603
2535	5322 126 11578	1nF 10% 50V 0603
2600	4822 126 14494	22nF 10% 25V 0603
2601	4822 126 14247	0603 50V 1N5 COL R
2602	4822 126 14247	0603 50V 1N5 COL R
2603	4822 126 14305	100nF 10% 16V 0603
2604	4822 124 12095	100uF 20% 16V
2605	4822 126 14494	22nF 10% 25V 0603
2606	4822 124 12095	100uF 20% 16V
2607	4822 124 12095	100uF 20% 16V
2608	4822 124 23002	10uF 16V
2609	4822 124 80151	47uF 16V
2610	4822 126 14305	100nF 10% 16V 0603
2611	4822 124 12095	100uF 20% 16V
2614	4822 122 33777	47pF 5% 63V
2615	4822 122 33777	47pF 5% 63V
2616	4822 122 33777	47pF 5% 63V
2617	4822 122 33777	47pF 5% 63V
2620	4822 122 33777	47pF 5% 63V

2621	4822 122 33777	47pF 5% 63V
2622	4822 122 33777	47pF 5% 63V
2623	4822 122 33777	47pF 5% 63V
2624	4822 122 33777	47pF 5% 63V
2625	4822 122 33777	47pF 5% 63V
2626	4822 122 33777	47pF 5% 63V
2627	4822 122 33777	47pF 5% 63V
2632	4822 124 12095	100uF 20% 16V
2633	4822 124 12095	100uF 20% 16V
2634	4822 126 14305	100nF 10% 16V 0603
2635	4822 126 14305	100nF 10% 16V 0603
2636	4822 126 14305	100nF 10% 16V 0603
2637	4822 126 14305	100nF 10% 16V 0603
2638	4822 126 14305	100nF 10% 16V 0603
2639	4822 126 14305	100nF 10% 16V 0603
2646	4822 124 23002	10uF 16V
2647	4822 122 33777	47pF 5% 63V
2648	4822 33761	22pF 5% 50V
2649	4822 126 14305	100nF 10% 16V 0603
2650	4822 126 14305	100nF 10% 16V 0603
2700	4822 126 14305	100nF 10% 16V 0603
2701	4822 126 14305	100nF 10% 16V 0603
2702	4822 126 14305	100nF 10% 16V 0603
2703	4822 126 14305	100nF 10% 16V 0603
2704	4822 126 14305	100nF 10% 16V 0603
2705	4822 126 14305	100nF 10% 16V 0603
2706	4822 126 14305	100nF 10% 16V 0603
2707	4822 124 80349	47uF 20% 6.3V
2800	4822 124 23002	10uF 16V
2801	4822 124 23002	10uF 16V
2802	4822 126 14305	100nF 10% 16V 0603
2803	4822 126 14305	100nF 10% 16V 0603
2804	4822 126 14305	100nF 10% 16V 0603
2805	4822 126 14305	100nF 10% 16V 0603
2806	4822 126 14305	100nF 10% 16V 0603
2807	4822 126 14305	100nF 10% 16V 0603
2808	4822 126 14305	100nF 10% 16V 0603
2809	4822 126 14305	100nF 10% 16V 0603
2810	4822 126 14305	100nF 10% 16V 0603
2811	4822 126 14305	100nF 10% 16V 0603
2812	4822 126 14305	100nF 10% 16V 0603
2813	4822 126 14305	100nF 10% 16V 0603
2814	4822 126 14305	100nF 10% 16V 0603
2815	4822 126 14305	100nF 10% 16V 0603
2816	4822 126 14305	100nF 10% 16V 0603
2817	4822 126 14305	100nF 10% 16V 0603
2818	4822 126 14305	100nF 10% 16V 0603
2819	4822 126 14305	100nF 10% 16V 0603
2820	4822 126 14305	100nF 10% 16V 0603
2821	4822 126 14305	100nF 10% 16V 0603
2822	4822 126 14305	100nF 10% 16V 0603
2823	4822 124 23002	10uF 16V
2824	4822 126 14305	100nF 10% 16V 0603
2825	4822 124 23002	10uF 16V
2826	4822 126 14305	100nF 10% 16V 0603
2827	5322 126 11583	10nF 10% 50V 0603
2828	4822 126 14225	56pF 5% 50V 0603
2829	4822 126 14305	100nF 10% 16V 0603
2830	4822 126 14305	100nF 10% 16V 0603
2831	4822 126 14305	100nF 10% 16V 0603
2832	4822 126 14238	0603 50% 02Z COL R
2833	5032 126 14305	100nF 10% 16V 0603
2834	4822 126 14305	100nF 10% 16V 0603
2835	4822 126 14305	100nF 10% 16V 0603
2901	5322 126 11583	10nF 10% 50V 0603
2902	4822 126 14305	100nF 10% 16V 0603
2903	4822 126 14305	100nF 10% 16V 0603
2905	4822 126 14305	100nF 10% 16V 0603
2906	4822 122 33761	22pF 5% 50V
2907	4822 122 33761	22pF 5% 50V

3625	4822 051 30339	33Ω 5% 0.062W
3626	4822 051 30102	1k 5% 0.062W
3627	4822 051 30471	470Ω 5% 0.062W
3628	4822 051 30471	470Ω 5% 0.062W
3629	4822 051 30472	470Ω 5% 0.062W
3630	4822 051 30221	220Ω 5% 0.062W
3631	2322 704 64301	RST SM 0603 RC22H 430Ω PM1 R
3632	2322 704 64301	RST SM 0603 RC22H 430Ω PM1 R
3633	2322 704 64301	RST SM 0603 RC22H 430Ω PM1 R
3635	4822 051 30682	6k8 5% 0.062W
3636	4822 051 30682	6k8 5% 0.062W
3637	4822 051 30332	3k3 5% 0.062W
3642	4822 051 30103	10k 5% 0.062W
3647	2322 704 64301	RST SM 0603 RC22H 430Ω PM1 R
3648	2322 704 64301	RST SM 0603 RC22H 430Ω PM1 R
3651	2322 704 64301	RST SM 0603 RC22H 430Ω PM1 R
3654	2322 704 64301	RST SM 0603 RC22H 430Ω PM1 R
3655	2322 704 64301	RST SM 0603 RC22H 430Ω PM1 R
3656	2322 704 64301	RST SM 0603 RC22H 430Ω PM1 R
3657	2322 704 64301	RST SM 0603 RC22H 430Ω PM1 R
3658	4822 051 30102	1k 5% 0.062W
3659	4822 051 30102	1k 5% 0.062W
3660	4822 051 30102	1k 5% 0.062W
3661	2322 704 64301	RST SM 0603 RC22H 430Ω PM1 R
3662	4822 051 30102	1k 5% 0.062W
3663	4822 051 30102	1k 5% 0.062W
3664	2322 704 64301	RST SM 0603 RC22H 430Ω PM1 R
3665	4822 117 12139	22Ω 5% 0.062W
3667	4822 051 30339	33Ω 5% 0.062W
3672	4822 051 30479	47Ω 5% 0.062W
3686	4822 051 30223	22k 5% 0.062W
3687	4822 051 30223	22k 5% 0.062W
3688	4822 051 30472	4k7 5% 0.062W
3689	4822 051 30223	22k 5% 0.062W
3691	4822 051 30339	33Ω 5% 0.062W
3702	4822 051 30102	1k 5% 0.062W
3800	4822 051 30479	47Ω 5% 0.062W
3901	4822 051 30339	33Ω 5% 0.062W
3902	4822 051 30331	330Ω 5% 0.062W
3905	4822 051 30479	47Ω 5% 0.062W
3906	4822 051 30153	15k 5% 0.062W
3907	4822 051 30682	6k8 5% 0.062W
3908	4822 051 30332	3k3 5% 0.062W
3909	4822 051 30332	3k3 5% 0.062W
3910	4822 051 30332	3k3 5% 0.062W
3911	4822 051 30332	3k3 5% 0.062W
3912	5322 117 13042	3k9 1% 0.063W 0603 RC22H
3913	5322 117 13042	3k9 1% 0.063W 0603 RC22H
3914	4822 051 30181	180Ω 5% 0.062W
3914	4822 051 30339	33Ω 5% 0.062W
3916	4822 051 30101	100Ω 5% 0.062W
3900	4822 051 30103	10k 5% 0.062W
3901	4822 051 30103	10k 5% 0.062W
3902	4822 051 30339	33Ω 5% 0.062W
3903	4822 051 30339	33Ω 5% 0.062W
3904	4822 051 30331	330Ω 5% 0.062W
3904	4822 051 30339	33Ω 5% 0.062W
3905	4822 051 30221	220Ω 5% 0.062W
3906	4822 051 30339	33Ω 5% 0.062W
3907	2322 704 65609	RST SM 0603 RC22H 56Ω PM1 R
3907	4822 051 30339	33Ω 5% 0.062W
3908	4822 051 30339	33Ω 5% 0.062W
3908	4822 051 30479	47Ω 5% 0.062W
3909	4822 051 30332	3k3 5% 0.062W
3910	2322 704 65609	RST SM 0603 RC22H 56Ω PM1 R

5503	4822 157 71206	BLM21A601SPT
5504	4822 157 71206	BLM21A601SPT
5600	4822 157 71206	BLM21A601SPT
5601	4822 157 11499	BLM11P500SPT
5602	4822 157 10547	15μH 5%
5604	4822 157 10547	15μH 5%
5605	4822 157 10547	15μH 5%
5606	4822 157 10547	15μH 5%
5607	4822 157 10547	15μH 5%
5608	4822 157 10547	15μH 5%
5609	4822 157 11717	BLM31P500SPT
5610	4822 157 11717	BLM31P500SPT
5611	4822 157 11717	BLM31P500SPT
5700	4822 157 11717	BLM31P500SPT
5800	4822 157 11717	BLM31P500SPT
5801	4822 157 11717	BLM31P500SPT
5802	4822 157 11717	BLM31P500SPT
5900	4822 157 11717	BLM31P500SPT
5901	4822 157 11717	BLM31P500SPT
5902	4822 157 11717	BLM31P500SPT
5903	4822 157 11717	BLM31P500SPT



6200	4822 130 11397	BAS316
6301	9322 128 69685	S1D
6302	9322 128 69685	S1D
6303	9322 128 69685	S1D
6600	4822 130 11528	1PS76SB10



7000	9337 144 60118	IC SM 74HCT4066D (PHSE) R
7001	4822 130 60373	BCR56B
7002	5322 130 60159	BC846B
7003	5322 130 60159	BC846B
7004	5322 130 60159	BC846B
7005	5322 130 60159	BC846B
7006	5322 130 60159	BC846B
7007	5322 130 60159	BC846B
7100	5322 130 42718	BFS20
7101	5322 130 42718	BFS20
7102	9352 637 37518	TZA1039HL
7103	4822 209 17229	BA5938FM
7104	4822 209 30095	LM833D
7105	4822 209 32073	MC34072D
7106	5322 130 42718	BFS20
7107	4822 209 33411	MC78L05ACD
7108	5322 130 60845	BC807-25
7109	4822 209 15083	AN78M09
7110	5322 130 60803	BST72A
7111	5322 130 60159	BC846B
7112	5322 130 60159	BC846B
7113	5322 130 60159	BC846B
7114	5322 130 60159	BC846B
7115	4822 130 60373	BCR56B
7116	5322 130 60159	BC846B
7117	4822 130 42804	BC817-25
7201	9351 869 80118	AN29F002T/4.3.13
7202	3104 123 85860	BC856B
7203	4822 130 60373	BCR56B
7204	9322 139 67685	IC SM MC33464N-45A (MOTA) R
7207	9352 636 60557	SAAT399HL/M2A
7304	4822 209 16877	BA6856FP
7310	4822 209 15899	CY7C199-15C
7311	9352 637 83557	IC SM SAA7335HL/E/M2 (PHSE) Y
7312	4822 130 60373	BCR56B
7315	5322 130 60159	BC846B
7400	9352 499 60118	IC SM 74LVC00AD (PHSE) R
7404	9322 144 59668	IC SM MT48LC1M16A1TG-7S (MRN)R
7405	9322 144 59668	IC SM MT48LC1M16A1TG-7S (MRN)R
7452	5322 130 60159	BC846B
7453	5322 130 60159	BC846B
7454	5322 130 60159	BC846B
7455	4822 130 60373	BCR56B

7503	9322 151 16671	STI5505AVC
7505	4822 209 17377	M24C32-WMN6/PROG
7505	8204 056 05580	M24C32-WMN6TNKSA
7600	5322 209 71568	PC74HCT14T
7604	5322 130 60159	BC846B
7605	4822 209 17398	LD1117DT33
7607	5322 130 60159	BC846B
7608	4822 130 60373	BCR56B
7609	4822 130 60373	BCR56B
7610	5322 130 60159	BC846B
7611	9352 456 80115	

7612	5322 130 60159	BC846B
7613	5322 130 60159	BC846B
7614	5322 130 60159	BC846B
7615	5322 130 60159	BC846B
7617	5322 130 60159	BC846B
7618	5322 130 60159	BC846B
7620	4822 130 60373	BCR56B
7621	4822 130 42804	BC817-25
7622	4822 209 17398	LD1117DT33
7700	9322 144 96668	IC SM MT48LC4M16A2TG-8E (MRN)R
7800	9352 680 19557	SAAT331HL/M1
7801	5322 130 42718	BFS20
7802	9352 611 78118	74HC1GU04GW
7900	4822 209 90752	74HCT04D
7902	9322 153 36668	IC SM ICS302M-3 (ICSI) R
7903	9322 151 72668	IC SM ICS601M-01T (MCL) R
7905	9322 151 71668	IC SM MK2703STR (MCL) R

DVD1000/171

Various

0001	3104 127 11490	FRONT AL ASSY
0002	3104 127 12140	FRONT ASSY
0004	3104 127 12880	WINDOW ASSY
0006	3104 127 12150	HOLDER RIGHT COMPLETE
0007	3104 127 12270	POWER ON/OFF KNOB ASSY
0012	3104 127 12180	HOLDER LEFT ASSY
0050	3104 120 00260	SA-CD BADGE
0065	3104 127 11520	TRAY FRONT COMPLETE SA-CD1000
0075	3104 118 90180	TAPTITE SCREW TORX + SPIKES
0076	3104 118 90180	TAPTITE SCREW TORX + SPIKES
0077	3104 118 90180	TAPTITE SCREW TORX + SPIKES
0078	3104 118 90180	TAPTITE SCREW TORX + SPIKES
0081	9305 023 61101	VAL6011/02
0081	9305 023 61102	VAL6011/02
0086	3104 126 25210	DUST CAP
0151	3104 127 11930	COVER ASSY
0251	3104 127 10740	FOOT SILVER ASSY
0252	3104 127 10740	FOOT SILVER ASSY
0253	3104 127 10740	FOOT SILVER ASSY
0254	3104 127 10740	FOOT SILVER ASSY
0301	3104 128 92810	MAINSCORD US CLASS 1 NO GROUND
0309	3104 125 23800	USER MANUAL SACD USA (4-LANG)
0316	3104 128 92490	VIDEO CORD SET GOLD PLATED
0318	3104 207 10850	IRT PROD ASSY RC2055/01 PACKED
0320	4822 321 22611	
0321	4822 321 22611	
0322	4822 321 22611	
0323	4822 321 22611	
0324	4822 321 61452	GOLD PLATED YUV-CINCH CABLE
0326	3104 128 92770	MONOBOARD 4285 ASSY SACD1000
0370	4822 321 61849	PCBAS AV DVD711 SACD
1002	3139 248 80720	PSU SACD1000 SRV1122WW MITSUMI
1004	3104 129 22150	TRAF0 ASSY SACD NUVOTEM
1007	3104 128 70230	CWAS FLEX SACD 24 108 32S
8003	3104 157 11860	CWAS FLEX DVD 22 180 32S
8006	3104 157 11960	CWAS FLEX DVD 22 180 32S
8007	3104 157 11950	CWAS FLEX DVD 16 180 32S

SACD1000/691

Various

0001	3104 127 11490	FRONT AL ASSY
0002	3104 127 12140	FRONT ASSY
0004	3104 127 12880	WINDOW ASSY

0006	3104 127 12150	HOLDER RIGHT COMPLETE
0007	3104 127 12270	POWER ON/OFF KNOB ASSY
0010	3104 124 05450	LIGHT CONDUCTOR
0012	3104 127 12160	HOLDER LEFT ASSY
0050	3104 120 00260	SA-CD BADGE
0065	3104 127 11520	TRAY FRONT COMPLETE SA-CD1000
0075	3104 118 90180	TAPTITE SCREW TORX + SPIKES
0076	3104 118 90180	TAPTITE SCREW TORX + SPIKES
0077	3104 118 90180	TAPTITE SCREW TORX + SPIKES
0078	3104 118 90180	TAPTITE SCREW TORX + SPIKES
0081	9305 023 61101	DUST CAP
0086	3104 126 25210	COVER ASSY
0151	3104 127 11930	FOOT SILVER ASSY
0251	3104 127 10740	FOOT SILVER ASSY
0252	3104 127 10740	FOOT SILVER ASSY
0253	3104 127 10740	FOOT SILVER ASSY
0254	3104 127 10740	FOOT SILVER ASSY
0301	3104 128 92800	MAINSCORD EU CLASS 1 NO GROUND
0309	3104 125 23800	USER MANUAL SACD USA (4-LANG)
0316	3104 128 92490	VIDEO CORD SET GOLD PLATED
0318	3104 207 10850	IRT PROD ASSY RC2055/01 PACKED
0320	4822 321 22611	
0321	4822 321 22611	
0322	4822 321 22611	
0323	4822 321 22611	
0324	4822 321 61452	GOLD PLATED YUV-CINCH CABLE
0326	3104 128 92770	MONOBOARD 4285 ASSY SACD1000
0370	4822 321 61849	PCBAS AV DVD711 SACD
1002	3139 248 80720	PSU SACD1000 SRV1122WW MITSUMI
1004	3104 129 22150	TRAF0 ASSY SACD NUVOTEM
1007	3104 128 70230	CWAS FLEX SACD 24 108 32S
8003	3104 157 11860	CWAS FLEX DVD 22 180 32S
8006	3104 157 11960	CWAS FLEX DVD 22 180 32S
8007	3104 157 11950	CWAS FLEX DVD 16 180 32S